EXHIBIT 1
PUBLIC REDACTED VERSION

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

IN RE GOOGLE PLAY STORE ANTITRUST LITIGATION THIS DOCUMENT RELATES TO: *In re Google Play Consumer Antitrust Litigation*, Case No. 3:20-cv-05761-JD *State of Utah et al. v. Google LLC et al.*, Case No. 3:21-cv-05227-JD	No. 3:21-md-02981-JD **MERITS REPORT OF** **HAL J. SINGER, PH.D.** Judge: Hon. James Donato

PARTY AND NON-PARTY HIGHLY CONFIDENTIAL – ATTORNEYS' EYES ONLY

INTRODUCTION AND SUMMARY OF CONCLUSIONS

1. Google Play (the "Play Store"), owned and operated by Google,[1] is the largest distributor of Android-compatible software applications for mobile devices ("Apps") and the only store that can reach virtually every Android mobile user outside of China.[2] With limited exceptions, Google has until very recently charged a uniform headline "take rate"[3] equal to 30 percent of all revenues on the initial sale and downloading of Apps from the Play Store and the subsequent sale of digital content consumed within Apps ("In-App Content").[4] Counsel for Mary Carr, Daniel Egerter, Zack Palmer, Serina Moglia, Matthew Atkinson, and Alex Iwamoto, on behalf of themselves and all others similarly situated[5] (the "Consumer Plaintiffs" or "Classes"), have asked me to assess Google's market power in App distribution and related markets, the competitive effects of the various restrictions Google enforces, and other conduct Google has undertaken in connection with its Play Store (collectively, the "Challenged Conduct").[6] I have also been asked to assess on behalf of the Consumer Plaintiffs and Plaintiff States[7] whether, as a result of the Challenged Conduct, consumers have overpaid for the initial downloads of Apps through the Play Store or for subsequent purchases of In-App Content, and to calculate aggregate damages for U.S. Consumers resulting from any such overpayments, including the Damages Class.[8]

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1. Google includes Google, LLC, Google Ireland Ltd., Google Commerce Ltd., Google Asia Pacific Pte. Ltd., and Google Payment Corp.

2. All of the relevant geographic markets at issue here are worldwide excluding China, where the Play Store is blocked. *See, e.g.,* Sherisse Pham, *Google now has two Apps in China, but search remains off limits*, CNN BUSINESS (May 31, 2018), money.cnn.com/2018/05/31/technology/google-in-china-files-app/index.html ("The company's own App store, Google Play, remains blocked in China[.]"); *see also* Part I.B below. All references to "global" markets or the use of the terms "globally" or "world" in this report assume that China is excluded unless stated otherwise.

3. To describe its price to developers, Google uses the terminology "revenue share," which reflects the fact that Google is taking a portion of the developers' revenues, injecting itself as a "partner" in the customer-developer relationship. (Google sometimes uses the term "service fee" instead of "revenue share.") Google also uses the term "revenue share" to refer to the portion of the take rate Google has shared with mobile carriers and original equipment manufacturers. For ease of exposition, I use the term "take rate" to capture Google's price charged to developers.

4. As shown in Tables 6 and 8, *infra*, Google's average take rate across all transactions on the Play Store during the Class Period (August 16, 2016 through May 31, 2022) exceeds [redacted]t for both initial downloads and In-App Content. The reason why the average take rate is slightly below [redacted] is that Google gives discounts from its baseline rate under certain limited circumstances described in this report. While Google's online policies have changed over time, In-App Content as used in this report is consistent with what Google refers to as "in-App purchases." Google's current policy states: "Play-distributed Apps requiring or accepting payment for access to in-App features or services, including any App functionality, digital content or goods (collectively "in-App purchases"), must use Google Play's billing system for those transactions" subject to discrete exceptions. *See* Play Console Help, https://support.google.com/googleplay/android-developer/answer/9858738.

5. The Classes refer to a class seeking damages (the "Damages Class") and a class seeking injunctive relief (the "Injunctive Class") as defined in Plaintiffs' class certification motion in *In re Google Play Consumer Antitrust Litigation*, Case No. 3:20-cv-05761-JD. *See* [Corrected] [Proposed] Order Granting Consumer Plaintiffs' Mot. For Class Certification (July 28, 2022) ¶¶1-2.

6. The Challenged Conduct includes Google's anticompetitive conduct in all of the relevant antitrust markets at issue here.

7. The Plaintiff States are those states where States Attorneys General have filed claims in *State of Utah et al. v. Google LLC et al.*, Case No. 3:21-cv-05227-JD.

8. In this report, unless otherwise explicitly stated, I calculate aggregate damages for all U.S. Consumers (defined as those with a billing address in the United States or its territories) who paid for an App through the Play Store or paid for In-App Content (including subscriptions or ad-free versions of apps) through Google Play Billing (as defined herein) on or after August 16, 2016, to the present ("U.S. Consumers").

2. In this report, I conclude that Google has monopoly power[9] in the market for licensable mobile operating systems, and in the market for the sale and distribution of Apps for Android mobile devices (the "Android App Distribution Market"). Google has gained and maintained such power through the imposition of exclusionary contractual provisions and artificial technological barriers that unnecessarily impede the distribution of Apps outside of the Play Store. I further conclude that Google has extended its power in the Android App Distribution Market into the aftermarket for services in support of consummating purchases of In-App Content on Android devices (the "In-App Aftermarket"). Google has gained and maintained significant market power in the In-App Aftermarket through anticompetitive, exclusionary contractual restrictions (the "Aftermarket Restrictions") that function as an economic tie-in of Google's Android App Distribution Market services to its In-App Aftermarket services. I conclude that the Challenged Conduct was anticompetitive; to the extent that there are any procompetitive benefits of the Challenged Conduct, they could have been achieved through less restrictive alternatives.[10]

3. I also demonstrate that, in the absence of Google's anticompetitive conduct, U.S. Consumers would have paid lower prices for both paid Apps and In-App Content. My analysis demonstrates that the Challenged Conduct resulted in antitrust injury to all or almost all U.S. Consumers, as well as members of the Injunctive Class. U.S Consumers suffered aggregate damages of [redacted] resulting from pass-through of cost savings from lower take rates.[11] I also present models that do not require proof of pass-through, because injury and damages result from a diminution in direct customer discounts, with aggregate damages of up to [redacted].[12] I also present a methodology for calculating damages for each individual U.S. Consumer. My conclusion that the Challenged Conduct was anticompetitive and caused antitrust injury to all or almost all U.S. Consumers and members of the Injunctive Class holds regardless of whether there are two relevant markets or just one.[13] In addition to the antitrust injury demonstrated herein, consumers

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9. Consistent with common practice in economics, I use the terms "market power" and "monopoly power" interchangeably. *See, e.g.,* DENNIS CARLTON & JEFFREY PERLOFF, MODERN INDUSTRIAL ORGANIZATION 244-282 (Pearson 2005 4th ed.).

10. In my class certification reports, I demonstrated how data, economic methods, and evidence common to all U.S. Consumers could be used to prove that consumers nationwide suffered antitrust injury attributable to Google's anticompetitive conduct. Absent Google's conduct, the prices consumers pay for applications would have been lower, or Google would have given U.S. Consumers a direct discount in the form of direct rewards and incentives, such as Play Point subsidies. Much of the analysis from my class certification report is incorporated and updated herein. *See* Class Certification Report of Hal J. Singer, PhD (February 28, 2022) [hereafter, "Singer Class Cert Report"]; *see also* Class Certification Reply Report of Hal J. Singer, PhD (April 25, 2022) [hereafter, "Singer Class Cert Reply"]; *see also* Class Certification Reply Report of Hal J. Singer, PhD (Errata) (May 10, 2022) [hereafter, "Singer Class Cert Reply Errata"].

11. These damages are calculated using a two-sided market model of App distribution and a one-sided model of the In-App Aftermarket. I sometimes refer to these two models collectively as the "App/In-App Model." All of my economic models use Play Store transaction data produced by Google ("Google Transactional Data"). The Google Transactional Data includes billions of records, and was produced in two batches. The first batch (GOOG-PLAY-007203251) was produced on July 27, 2021, and includes U.S. transactions from November 2010 through July 3, 2021. The second batch was produced on August 17, 2022, and includes U.S. transactions between July 4, 2021 through May 31, 2022.

12. These damages are calculated using a two-sided market model in which competition occurs over customer discounts ("Discount Model"), as well as a damages model based on the discounts that Amazon provides to customers accessing the Amazon Appstore via Google Android devices ("Amazon Discount Model").

13. I estimate a two-sided market model in which a single take rate applies to all paid transactions ("Single Take Rate Model"). In addition, neither the Discount Model nor the Amazon Discount Model require separate markets for App distribution and In-App purchases.

would also have benefitted further from enhancements to output, quality, and consumer choice in a more competitive but-for world.[14]

4. I have reviewed numerous materials to inform my opinions. The record documents and deposition testimony that I have relied upon are footnoted throughout this report.[15] I have also relied on academic literature, press reports, industry reports, government reports, court cases, and other materials, which are footnoted in this report and/or listed in Appendix 2. I have also relied on various datasets, including the Google Transaction Data, other data produced by Google, third-party data from IDC, Statcounter, Statista, and other sources, which are footnoted in this report and/or listed in Appendix 2. In preparing this report, I was assisted by a staff of expert economists and analysts. I directed their analyses and activities. My staff has had access to transcripts of all depositions taken in this matter and all materials produced in this matter through the document management database.[16]

QUALIFICATIONS

5. I am a managing director at Econ One, an economic consulting firm which provides expert economic and econometric analysis for antitrust cases. I am also an Adjunct Professor at the University of Utah, where I teach antitrust economics to graduate students in economics.

6. I am an applied microeconomist with an emphasis on industrial organization and regulation. In an academic capacity, I have published several books and book chapters, spanning a range of industries and topics, and my articles have appeared in dozens of legal and economic journals. My competition-related articles have appeared in multiple American Bar Association (ABA) Antitrust Section journals, and I have been a panelist at several ABA Antitrust events. In a consulting capacity, I have been nominated for antitrust practitioner of the year among economists by the American Antitrust Institute (AAI) for my work in *Tennis Channel v. Comcast*, and AAI named me as co-Honoree in the same category in 2018 for my work *In Re Lidoderm Antitrust Litigation*. I have specific experience and expertise in antitrust class action cases focusing on labor-side markets, like the Grower market here. For instance, I have served as an expert in antitrust cases on behalf of proposed and certified classes of mixed martial arts fighters, nurses, and other employees.

7. I have testified as an economic expert in state and federal courts, as well as before regulatory agencies. I also have testified before the House Judiciary Subcommittee on Antitrust

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14. Plaintiffs have proposed injunctive relief for an injunctive class. *See* [Corrected] [Proposed] Order Granting Consumer Plaintiffs' Mot. For Class Certification (July 28, 2022) ¶2. This report demonstrates widespread and substantial antitrust injury resulting from the Challenged Conduct. Accordingly, the proposed injunctive class would benefit from removal of the Challenged Conduct.

15. Consistent with standard practice, my economic opinions herein rely in part on qualitative evidence such as documents and deposition testimony. *See, e.g.,* Jonathan B. Baker & Timothy F. Bresnahan, *Economic Evidence in Antitrust: Defining Markets and Measuring Market Power*, *in* Paulo Buscossi, ed. HANDBOOK OF ANTITRUST ECONOMICS (2007) [hereafter, "Baker & Bresnahan"], at 4 ("[W]e give qualitative and quantitative evidence equal attention below when we discuss identification with respect to the market definition and market power inquiries."). Qualitative evidence is typically important for understanding the facts that inform an applied economic analysis (as opposed to a purely theoretical exercise). I do not offer any expert opinions as to the interpretation of individual documents, deposition testimony, or other qualitative evidence.

16. I and my staff have access to the full set of depositions taken to date in this matter, although I did not specifically rely on all of them in forming my opinions.

and the Senate Judiciary Subcommittee on Competition Policy, Antitrust, and Consumer Rights on the interplay between antitrust and sector-specific regulation. Federal courts have relied on my work in certifying seven classes in antitrust matters,[17] and two classes in consumer protection matters.[18] My full curriculum vitae appears as Appendix 1 to this report and reflects a full list of the cases in which I have served as a testifying expert since 2014 and a list of publications I have authored in the last ten years.

8. Econ One is compensated at my standard hourly rate of $885 for my work in this matter. My compensation is not contingent on my opinions or the outcome of this case.

INDUSTRY OVERVIEW

9. Smart mobile devices, and smartphones in particular, have become ubiquitous in daily life, essential providers of communication, entertainment, and information.[19] These hand-held portable computers can be used almost anywhere, allowing us to connect to the internet from any location that offers the requisite cellular or wi-fi network. Whether you want to buy stock in GameStop, check the score of the San Francisco 49ers game, or call your mother—mobile devices do it all.

10. Like the mini-computers they are, mobile devices are comprised of both hardware and software. The hardware typically consists of an LCD or OLED flat screen and some combination of physical buttons, digital keypads, and, ever more frequently, a touchscreen interface.[20] As with desktop or laptop computers, mobile devices are controlled by an operating

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17. *See Meijer, Inc. v. Abbott Laboratories*, No. C 07-5985 CW, 2008 WL 4065839 (N.D. Cal. Aug. 27, 2008) (Order Granting Plaintiffs' Motion for Class Certification); *Natchitoches Parish Hosp. Serv. Dist. v. Tyco Intl., Ltd.*, 262 F.R.D. 58 (D. Mass. 2008) (Granting Motion to Certify Class); *Southeast Missouri Hospital and St. Francis Medical Center v. C.R. Bard*, No. 1:07cv0031 TCM, 2008 WL 4372741 (E.D. Mo. Sept. 22, 2008) (Granting in Part Motion for Class Certification); *Johnson v. Arizona Hosp. and Healthcare Assoc.* No. CV 07-1292-PHX-SRB, 2009 WL 5031334 (D. Ariz. July 14, 2009) (Granting in Part Motion for Class Certification); *In re Delta/AirTran Baggage Fee Antitrust Litig.,* 317 F.R.D. 665 (N.D. Ga. 2016) (Granting Motion to Certify Class); and *In re Lidoderm Antitrust Litig.*, No. 12-md-02521, 2017 WL 679367 (N.D. Cal. Feb. 21, 2017) (Order Granting Motions for Class Certifications and Denying Daubert Motions); *Cung Le, et al. v. Zuffa*, *LLC d/b/a Ultimate Fighting Championship*, Minute Entry, 2:15-cv-01045-RFB-BNW (D. Nev. Dec. 10, 2020), ECF No. 781 (announcing the court's intention to grant the Plaintiffs' Motion for Class Certification). As of the time of this report, the court has not issued the written opinion certifying the class in *Zuffa*.

18. *See In Re: MacBook Keyboard Litigation,* Case No. 5:18-cv-02813-EJD, 2021 WL 1250378 (N.D. Cal., Mar. 8, 2021) (Order Granting Motion to Certify Class); *In Re: JUUL Labs, Inc., Marketing, Sales Practices, and Products Liability Litigation*, Case No. 19-md-02913-WHO (N.D. Cal., Dec. 5, 2021) (Tentative Opinions on Motion for Class Certification, Daubert Motions, and Motion to Dismiss Bellwether Claims).

19. Smartphone ownership in the United States has more than doubled in the past ten years. As of 2021, 85 percent of adults in the U.S. owned a smartphone, up from 35 percent in 2011. *See* PEW RESEARCH CENTER, *Mobile Fact Sheet* (April 7, 2021), pewresearch.org/internet/fact-sheet/mobile/. *See also* U.S. CENSUS BUREAU, *Computer and Internet Use in the United States: 2018* (April 2021), census.gov/content/dam/Census/library/publications/2021/acs/acs-49.pdf at 2 (As of 2018, "[s]martphone ownership surpassed ownership of all other computing devices. Smartphones were present in 84 percent of households, while 78 percent of households owned a desktop or laptop. Tablet ownership fell behind at 63 percent.").

20. *See* IGI GLOBAL, HANDBOOK OF RESEARCH ON THE SOCIETAL IMPACT OF DIGITAL MEDIA, igi-global.com/dictionary/use-of-Apps-and-devices-for-fostering-mobile-learning-of-literacy-practices/18837 ("A mobile device is a computing device small enough to hold and operate in the hand. Typically, any handheld computer device will have an LCD or OLED flat screen interface, providing a touchscreen interface with digital buttons and keyboard or physical buttons along with a physical keyboard.").

system ("OS"), software that manages the device's hardware and software resources. Mobile operating systems provide the essential platform for the real work—and play—on mobile devices, which is performed by consumer "applications," more commonly known as "Apps," which are software programs designed to perform myriad functions.[21] Apps are typically displayed on the device screen through a representative image, known as an icon, and can be called by the user through a touch, a tap, or the click of a button. The App and the OS communicate with each other through an Application Program Interface ("API").[22] In addition, software development kits ("SDKs") facilitate App development by providing App developers with key functionality (relating to advertising, analytics, geolocation, payments, and many other areas) that the developer does not need to create from scratch.[23] Through their control of key software such as APIs and SDKs, mobile device operating systems exercise control over how an App can be developed to function on a given device. Mobile operating systems are not cross-compatible; an App designed to run on one operating system must be substantially re-written to function on a distinct operating system.[24]

11. Smartphone hardware is designed and produced by original equipment manufacturers ("OEMs"). As seen below, Samsung and Apple are the largest OEMs; others include LG, Lenovo, Nokia, and Huawei. Globally, Samsung and Apple accounted for more than

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21. *See, e.g.,* Case AT.40099—Google Android, Comm'n Decision, ¶228 (July 18, 2018) (summary at 2018 O.J. C (402) 19), ec.europa.eu/competition/antitrust/cases/dec_docs/40099/40099_9993_3.pdf ("The ability to install and use applications is a defining characteristic for a smartphone OS."). *See also* Catherine Hiley, *What are the different mobile operating systems*? USWITCH (July 12, 2022), uswitch.com/mobiles/guides/mobile-operating-systems/ ("Modern smartphones are closer to handheld computers that enable us to send emails, play games, watch the news and make video calls to loved ones. And much more besides. Operating systems are the software that run our desktop computers and laptops and manage their resources and memory when they're being used for multi-tasking. Smartphones have their own operating systems – also known as mobile OS – and it's this development that has brought advanced functions to mobiles that were previously only available on our computers. It's also a platform that developers can create applications or 'Apps' (software programs developed for smartphones that can carry out specific functions)[.]").

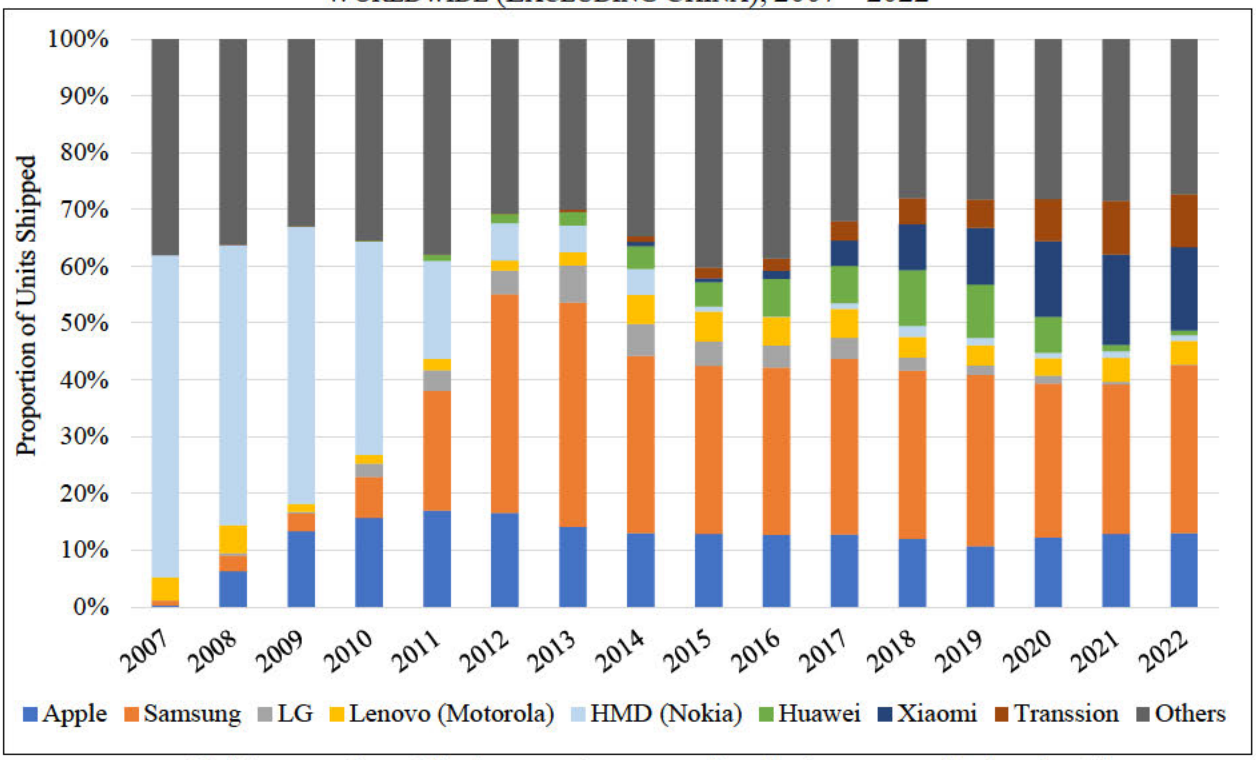
22. *See* Tom Nolle, *application program interface (API)*, TECHTARGET, techtarget.com/searchapparchitecture/definition/application-program-interface-API ("An application program interface (API) is code that allows two software programs to communicate with each other. An API defines the correct way for a developer to request services from an operating system (OS) or other application, and expose data within different contexts and across multiple channels."). *See also* Google APIs Explorer, developers.google.com/apis-explorer.

23. *See, e.g.,* APPFIGURES, *What's a Mobile SDK?*, appfigures.com/support/kb/626/whats-a-mobile-sdk ("A Software Development Kit, SDK for short, is a set of pre-written tools that provide App developers functionality that they don't have to write themselves…The most common types of SDKs you'll see in most Apps include: ads & monetization SDKs, analytics SDKs, and non-native development SDKs. But there are many others, like simple networking utilities, payments, notifications, and others.").

24. *See* Lionel Valdellon, *What Are the Different Types of Mobile Apps? And How Do You Choose?*, CLEVERTAP (Sep. 20, 2022), clevertap.com/blog/types-of-mobile-Apps/ ("Native Apps are built specifically for a mobile device's operating system (OS). […] [T]he problem with native Apps lies in the fact that if you start developing them, you have to duplicate efforts for each of the different platforms. The code you create for one platform cannot be reused on another. This drives up costs. Not to mention the effort needed to maintain and update the codebase for each version."). *See also* Jason Turnquist, *How Much Does App Development Cost?*, FYRESITE (July 31, 2020), fyresite.com/how-much-does-app-development-cost/ (Detailing how Uber might seem like one app, but is in reality four Apps: "a native iOS App for drivers, a native Android App for drivers, a native iOS App for riders, and a native android App for riders," where each new permission [app] created increases the price to develop it).

35 percent of smartphone shipments in 2021 and more than 40 percent of shipments in the first half of 2022. In the U.S., Samsung and Apple accounted for more than 73 percent of smartphone shipments in 2021 and through the first half of 2022. A number of OEMs, such as Amazon and LG, have exited the smartphone market over the years.[25] Some OEMs based in China, such as Huawei, Xiaomi, Vivo and Oppo, have expanded their footprint beyond China itself.[26]

FIGURE 1: OEM SHARE OF SMARTPHONE UNIT SHIPMENTS WORLDWIDE (EXCLUDING CHINA), 2007 – 2022

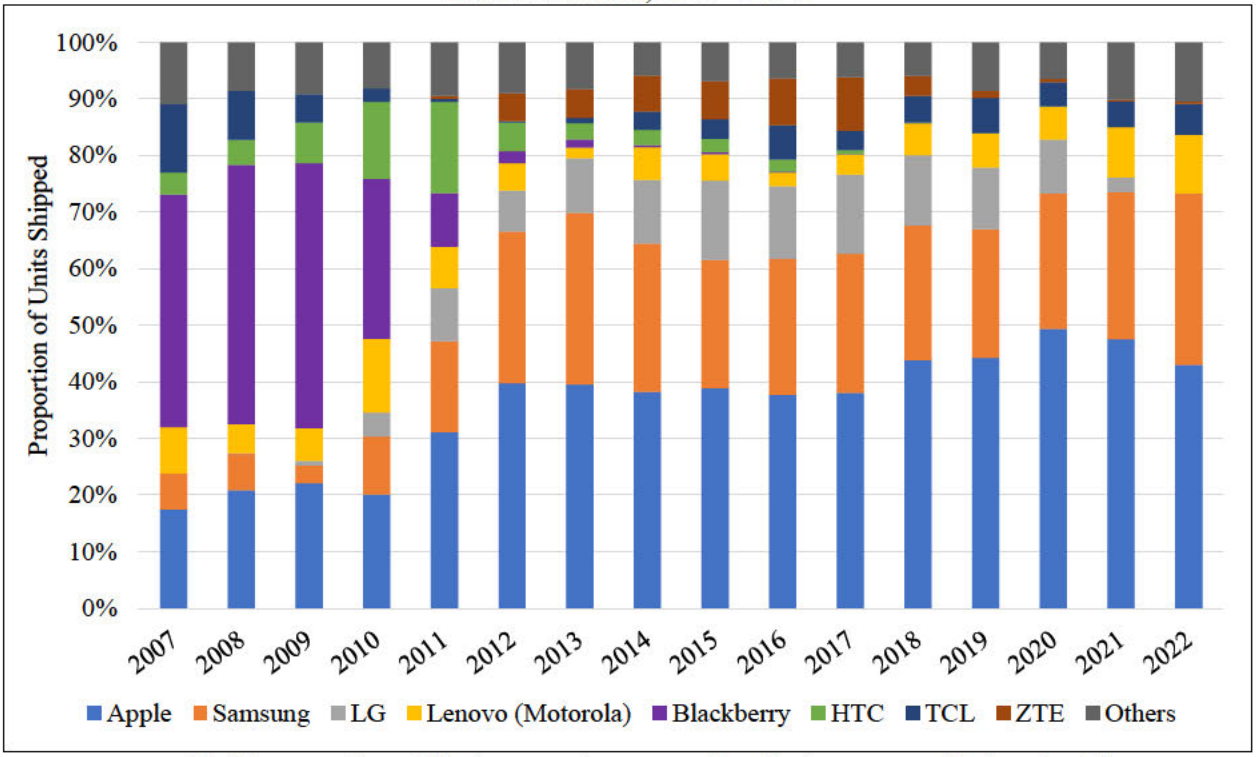


Source: IDC Worldwide Quarterly Mobile Phone Tracker. Appendix 8 displays comparable data for tablets. Data goes through 2022Q2.

25. *See, e.g.,* Tricia Duryee, "Amazon finally stops selling the Fire Phone, as company adjusts its hardware strategy," GEEKWIRE (Sept. 8, 2015), https://www.geekwire.com/2015/amazon-finally-stops-selling-the-fire-phone/; *see also* Ron Amadeo, *After a decade of failure, LG officially quits the smartphone market*, ARS TECHNICA (April 5, 2021), arstechnica.com/gadgets/2021/04/after-a-decade-of-failure-lg-officially-quits-the-smartphone-market/.

26. *See, e.g.,* Cheng Ting-Fang & Lauly Li, *China's Xiaomi, Vivo and Oppo trim smartphone orders by 20%*, FINANCIAL TIMES (May 25, 2022) (showing global market shares for Chinese OEMs). *See also* Scott Cendrowski, *How China's Smartphone 'Big Four' Are Fighting for Global Customers*, FORTUNE (Jan. 24, 2017), fortune.com/2017/01/24/china-smartphones-oppo-vivo-huawei-xiaomi/.

FIGURE 2: OEM SHARE OF SMARTPHONE UNIT SHIPMENTS
UNITED STATES, 2007 - 2022



Source: IDC Worldwide Quarterly Mobile Phone Tracker. Appendix 8 displays comparable data for tablets. Data goes through 2022Q2.

12. OEMs manufacture smartphones to run on wireless broadband networks owned and maintained by mobile network operators, also known as wireless carriers ("carriers"). Following the 2020 Sprint/T-Mobile merger, the U.S. currently has three dominant carriers (Verizon, AT&T, and T-Mobile).[27] These three carriers account for nearly 100 percent of U.S. wireless subscriptions, as did the top four carriers prior to the Sprint/T-Mobile merger.[28] Other countries have similar industry structures.[29] For example, the three dominant wireless carriers in Japan (NTT Docomo, KDDI Group, and SoftBank) accounted for over 97 percent of mobile subscribers in 2022, and this industry structure has remained stable since at least 2015.[30] Prior to the launch of Android mobile

27. *See, e.g.,* Marguerite Reardon & Roger Cheng, *T-Mobile and Sprint are one: What you need to know about the mobile mega-merger*, CNET (Apr. 3, 2020), cnet.com/tech/mobile/t-mobile-and-sprint-are-one-what-you-need-to-know-about-the-mobile-mega-merger/.

28. *See, e.g.,* Statista, *Wireless subscriptions market share by carrier in the U.S. from 1st quarter 2011 to 1st quarter 2022* (Sep. 9, 2022), statista.com/statistics/199359/market-share-of-wireless-carriers-in-the-us-by-subscriptions/.

29. *See, e.g.,* OECD, *Emerging Trends In Communication Market Competition*, OECD DIGITAL ECONOMY PAPERS (September 2021) at 15-16.

30. *See, e.g.,* Statista, *Distribution of mobile phone subscribers in Japan from 2015 to 2022, by operator* (Aug. 8, 2022), statista.com/statistics/892503/japan-mobile-phone-market-subscription-share-by-operator/ (showing that the three dominant Japanese carriers and their corresponding mobile virtual network operators ("MVNOs") account for the vast majority of Japanese mobile subscribers).

devices, carriers and OEMs provided not only the hardware for mobile devices, but also most of the software for their own devices.

13. When designing smartphones, OEMs must include a mobile OS that allows the device's hardware to run applications and programs.[31] Today, the only two major mobile device operating systems globally (excluding China) are Apple's iOS and Android.[32] Collectively, Google's Android and Apple's iOS make up over 99 percent of smartphones worldwide, excluding China.[33] Apple is the exclusive hardware producer of its popular iPhone (smartphone) and iPad (tablet) devices, which run Apple's proprietary iOS operating system. As seen below, even if one were to assume counterfactually that the relevant antitrust market includes iOS, there is a virtual duopoly in the market for mobile device operating systems, with the market split between mobile devices running on Apple's iOS and Google Android.[34] Mobile OSs other than Android and iOS comprise only a tiny fraction of the market. Figures 3A and 3B display mobile OS market shares based on smartphone unit sales. Android accounts for the vast majority of the mobile OS market globally, and for approximately 50 to 60 percent of the mobile OS market in the U.S. Industry analysts attribute the difference in market penetration to the higher cost of the iPhone, which is beyond the means of many non-U.S. residents.[35] In contrast, as late as 2010, iOS and Android together accounted for less than 40 percent of mobile operating systems worldwide, excluding China.[36] As seen in Appendix 8, market shares for tablets are similar, although the Windows OS has a small share.

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31. *See, e.g.,* Colin Steele, Definition: mobile operating system, TECH TARGET (March 2020), techtarget.com/searchmobilecomputing/definition/mobile-operating-system ("A mobile operating system (OS) is software that allows smartphones, tablet PCs (personal computers) and other devices to run applications and programs.").

32. *See, e.g.,* Sherisse Pham, *Google now has two Apps in China, but search remains off limits*, CNN BUSINESS (May 31, 2018), money.cnn.com/2018/05/31/technology/google-in-china-files-app/index.html ("The company's own App store, Google Play, remains blocked in China[.]").

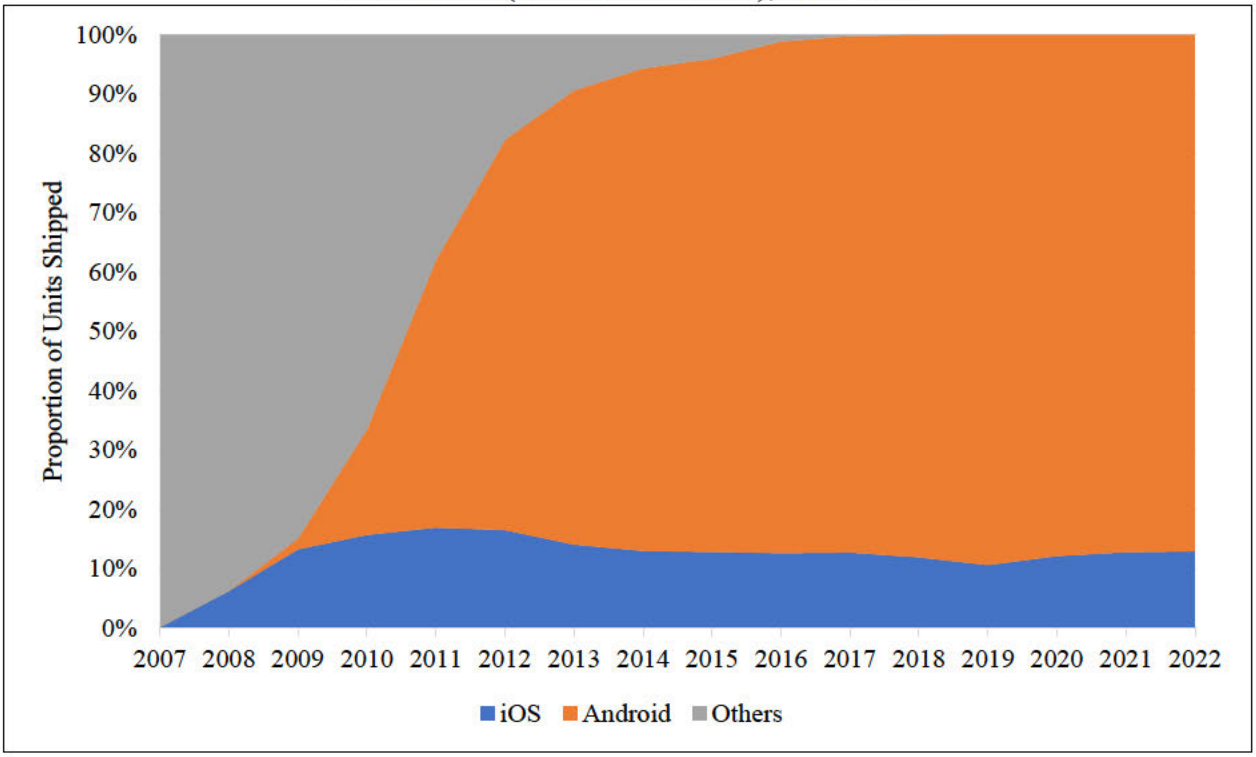
33. *See* Figures 3A-3B below. It bears noting that Android and Apple jointly dominate the marketplace for mobile operating systems in China as well. *See* Statista, *Market share of mobile operating systems in China from January 2013 to December 2021*, statista.com/statistics/262176/market-share-held-by-mobile-operating-systems-in-china/ (showing Android and Apple accounting for over two thirds and one fifth of the Chinese mobile operating market, respectively).

34. *See* Figures 3A-3B below. I include tablets in the market for mobile device operating systems, as OEMs (the buyer of mobile operating systems) selling both tablets and smartphones prefer that the operating system work seamlessly across mobile device types. *See, e.g.*, Vangie Beal, *What Are Examples of Mobile Operating Systems?*, WEBOPEDIA (Apr. 5, 2022), webopedia.com/insights/mobile-os-and-different-types/. The OEM's demand for compatibility in operating systems across the device types is derived from the demand from consumers, who share the same preferences. *See* Part I.A.1.b, *supra*, discussing customer lock-in for operating systems. When performing econometrics and estimating damages, I also include App transactions on tablets in Google's transactional database. In any event, my opinions regarding Google's market power or common impact flowing from the Challenged Conduct do not turn on whether tablets are included or excluded.

35. *See, e.g.,* Jason Cohen, *iOS More Popular in Japan and US, Android Dominates in China and India,* PCMAG (Sept. 4, 2020), https://www.pcmag.com/news/ios-more-popular-in-japan-and-us-android-dominates-in-china-and-india ("The iPhone holds less than 20 percent of the market in Brazil, Nigeria, and India. A major factor to consider is price. The Apple iPhone is a high-end, high-price product that many in emerging economies balk at when comparing it with mid-range devices that use the Android operating system.").

36. Felix Richter, *The Smartphone Duopoly*, STATISTA (August 13, 2021), statista.com/chart/3268/smartphone-os-market-share/ ("Having started out as a multi-platform market, the smartphone landscape has effectively turned into a duopoly in recent years, after Apple's iOS and Google's Android crowded out any other platform including

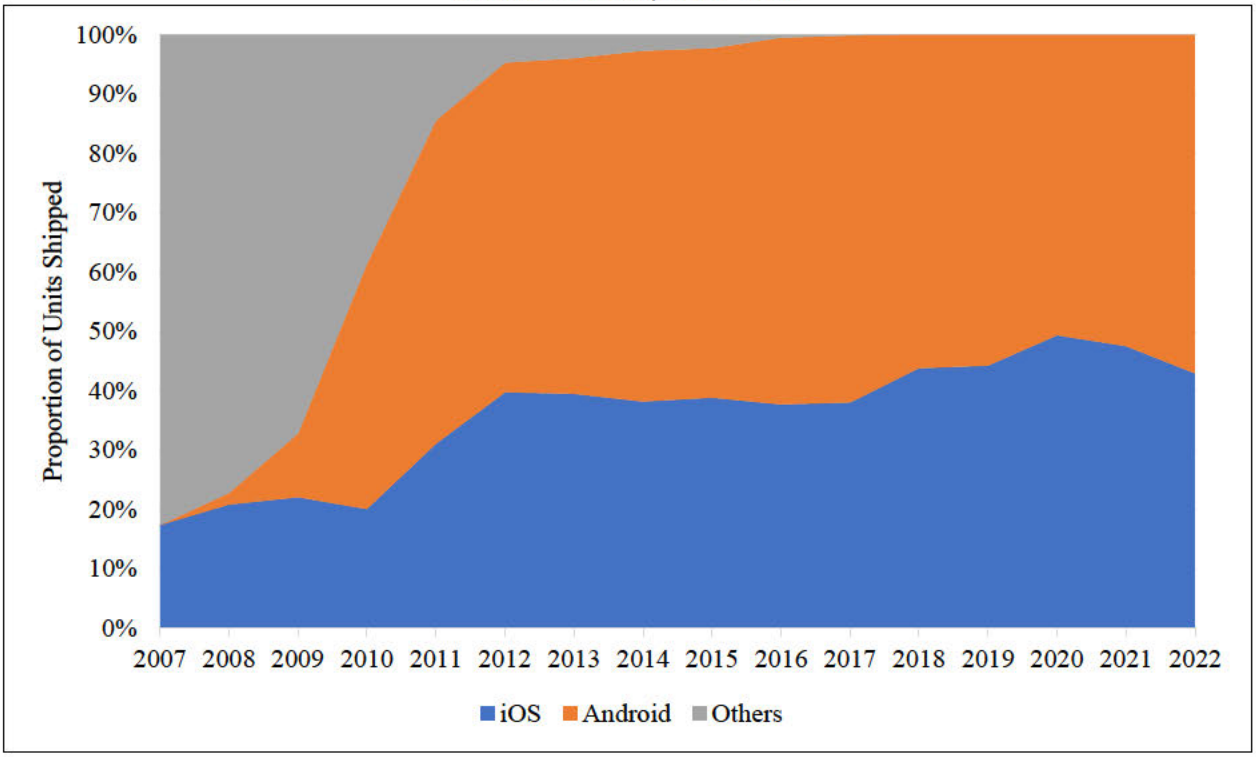
FIGURE 3A: MOBILE OS SHARE OF SMARTPHONE UNIT SHIPMENTS WORLDWIDE (EXCLUDING CHINA), 2007-2022



Source: IDC Worldwide Quarterly Mobile Phone Tracker. Appendix 8 displays comparable data for tablets. Data goes through 2022Q2.

Microsoft's Windows Phone, BlackBerry OS and Samsung's mobile operating system called Bada. . . Android devices accounted for 84.1 percent of global smartphone shipments in 2020, with Apple's iOS accounting for the remaining 15.9 percent. In 2010, the combined market share of Android and iOS was below 40 percent, with Nokia, Microsoft, BlackBerry and others sharing the rest of the market.").

FIGURE 3B: MOBILE OS SHARE OF SMARTPHONE UNIT SHIPMENTS
UNITED STATES, 2007-2022



Source: IDC Worldwide Quarterly Mobile Phone Tracker. Appendix 8 displays comparable data for tablets. Data goes through 2022Q2.

14. Similarly, the House Investigation of Competition in Digital Markets found that "[o]ver the past decade, once-strong competitors have exited the mobile OS market, and Google and Apple have built dominant positions that are durable and persistent. . . . other mobile OSs. . . make up less than 1% of the global mobile OS market."[37]

15. Google is the creator of the Google search engine. Google's business strategy has focused on providing free software and digital services,[38] which in turn collect information about users, ranging from personal identifying information like email and billing addresses, to areas of interest, to discrete preferences in products and services. Google does not sell the raw user information it collects,[39] choosing instead to monetize this information via its vast advertising business. Google provides advertising inventory including space on its Google Search result pages and its YouTube video platform as well as in the Play Store. It also provides tools used by both advertisers and online publishers in the purchase and sale of digital display advertising. Google's

37. *Investigation of Competition in Digital Markets: Majority Staff Report and Recommendations*, H.R. Subcomm. on Antitrust, Commercial and Administrative Law of the Comm. on the Judiciary [hereafter *Majority Staff Report*] (Oct. 6, 2020), at 101, judiciary.house.gov/uploadedfiles/competition_in_digital_markets.pdf?utm_campaign=4493-519 (chart showing iOS and Android market shares worldwide).

38. 2004 Founder's IPO Letter, From the S-1 Registration Statement, abc.xyz/investor/founders-letters/2004-ipo-letter/.

39. Google Safety Center, *Ads That Respect Your Privacy*, safety.google/privacy/ads-and-data/ ("We never sell your personal information.").

vast trove of user information, gathered across its range of free software products, including the Play Store, enhances the overall value of Google advertising products.[40]

16. In Google's earliest years, over 99 percent of its revenues were generated by its advertising business[41] and, in 2020, Google continued to generate over 80 percent of its total revenues from advertising.[42] Google's development of the Android operating system for mobile devices complements its advertising business because Google collects information about users, their devices, and their interactions with Apps every time an App is installed or updated on a Google Android device.[43] In addition, as consumers started to spend more time on mobile devices as compared to laptops and PCs, Google needed to ensure that Google's services reached mobile device users in order to collect user data. Accordingly, Google invested in Google Android so that these consumers would use its proprietary GMS suite of Apps and interfaces, allowing Google to bring its existing services and advertisements to more users, and to continue to collect valuable user data as consumers migrated to the use of mobile devices.[44]

17. When Google acquired Android in 2005, it was a little-known startup; Google launched the first public version of Android in 2008.[45] [redacted].[46] Unlike

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40. *See, e.g.*, Megan Graham & Jennifer Elias, *How Google's $150 billion advertising business works*, CNBC (May 18, 2021), cnbc.com/2021/05/18/how-does-google-make-money-advertising-business-breakdown- html. *See also* Competition & Markets Authority, *Online platforms and digital advertising: Market study final report* (July 1, 2020) at 228, assets.publishing.service.gov.uk/media/5fa557668fa8f5788db46efc/Final_report_Digital_ALT_TEXT.pdf ("Google has tags (including as a third-party) on over 80% of websites and over 85% of Apps on the Play Store, which allows it to form a more complete picture of users' ad exposures, across its own properties and a substantial proportion of other non-Google websites.").

41. Google SEC Form 10-K, for the fiscal year ended Dec. 31, 2007, at 39, sec.gov/Archives/edgar/data/1288776/000119312508032690/d10k htm.

42. Google SEC Form 10-K, for the fiscal year ended Dec. 31, 2020, at 10, sec.gov/Archives/edgar/data/1652044/000165204421000010/goog-20201231 htm

43. Google Privacy & Terms, *Google Privacy Policy*, policies.google.com/privacy?hl=en-US.

44. Android, *The best of Google, right on your devices*, www.android.com/gms/ ("Google Mobile Services (GMS) is a collection of Google applications and APIs that help support functionality across devices.").

45. *See, e.g.,* John Callaham, *Google made its best acquisition nearly 17 years ago: Can you guess what it was?*, ANDROID AUTHORITY (May 13, 2022), androidauthority.com/google-android-acquisition-884194/ ("Back in 2005, everyone thought of Google as just another ad-supported search company. However, nearly 17 years ago, on July 11, 2005, the company made what we think was its best acquisition to date. It purchased a little startup company called Android. At the time, there was no "Google buys Android" news headline to reveal the move; that would come a little later. Of course, we all know the deal was a great success — this website wouldn't exist if it wasn't. Using the skills of its new Android team members, Google spent the next three years developing an operating system for mobile devices. This culminated in the launch of the first public version of Android in 2008, released on the T-Mobile G1/HTC Dream. Today, Android is the most popular mobile OS in the world by a large margin.").

46. Deposition of Android co-founder and former Google executive Rich Miner (Sep. 8, 2022) [hereafter Miner Dep.] 31:15-32:23; 36:24-37:12. *See also* Miner Dep. 52:23-55:14 ([redacted]). *See also* GOOG-PLAY4-000775391 (showing Android revenue projections in the lead-up to acquisition by Google; [redacted]). *See also* GOOG-PLAY-001432366 ([redacted]); GOOG-PLAY-001337211 at -215 ([redacted]

iOS, the Android operating system is allegedly "open source," meaning that anyone can inspect, modify, or enhance the source code to manipulate the software. But while an open-source version of Android exists, the vast majority of OEMs manufacture Android OS devices that meet Google's compatibility requirements and are preloaded with a proprietary suite of Apps and interfaces that Google designed specifically for mobile devices ("Google Mobile Services" or "GMS").[47] Manufacturers who wish to use Android equipped with the full functionality and important Google application interfaces must sign a licensing agreement with Google. For purposes of this report, I refer to devices that are pre-loaded with the GMS suite of Apps as ("Google Android"). As seen in Figure 4 below, Google Android devices make up virtually all non-iOS smartphones outside of China. Google Android devices must comply with the Android Compatibility Program, in which Google "defines technical details of the Android platform and provides tools for OEMs to ensure developer applications run on a variety of devices."[48] [redacted][9] [redacted].[50] In addition, the Android name and logo are "not part of the assets available through the Android Open Source Project."[51] As seen in Figure 4 below, smartphones with Google Android account for the vast majority of all smartphones sold with licensed operating systems, both in the U.S. and worldwide. As seen in Appendix 8, market shares for tablets are similar, although the Windows OS has a small share.

[redacted]); GOOG-PLAY-011612978 at -985 ([redacted]). *See also* GOOG-PLAY-001055695 at -697 ([redacted]")

47. Android, *The best of Google, right on your devices*, android.com/gms/ ("Google Mobile Services (GMS) is a collection of Google applications and APIs that help support functionality across devices.").

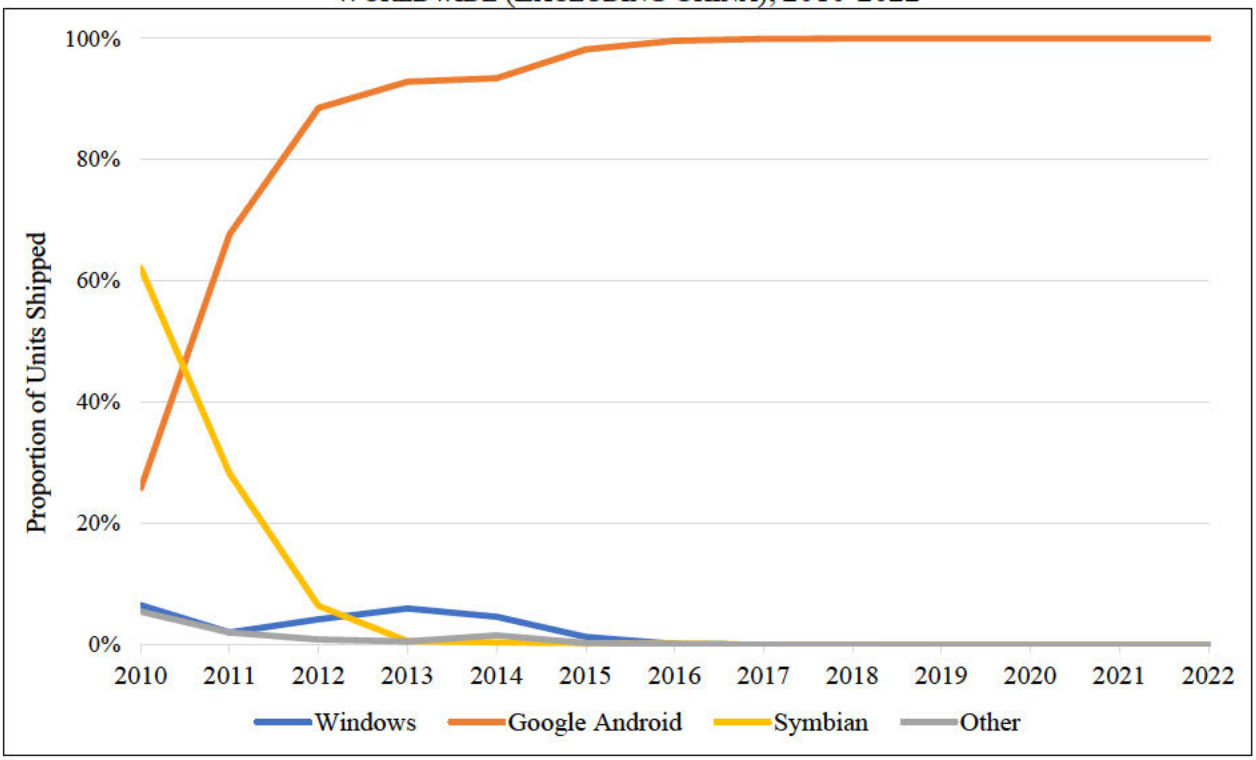
48. Android, *Android Compatibility Program Overview*, source.android.com/docs/compatibility/overview.

49. These contracts, referred to as Anti-Fragmentation Agreements or (more recently) Android Compatibility Commitments, are discussed further in Part IV.A.2 below.

50. These contracts, referred to as Mobile Application Distribution Agreements, are discussed further in Part IV.A.2 below.

51. Android, *Brand guidelines*, developer.android.com/distribute/marketing-tools/brand-guidelines ("The 'Android' name, the Android logo, the 'Google Play' brand, and other Google trademarks, are property of Google LLC and not part of the assets available through the Android Open Source Project.").

FIGURE 4: LICENSED MOBILE OS SHARE OF SMARTPHONE UNIT SHIPMENTS WORLDWIDE (EXCLUDING CHINA), 2010-2022



Source: IDC Worldwide Quarterly Mobile Phone Tracker. Appendix 8 displays comparable data for tablets. Data goes through 2022Q2.

18. Thus, although an OEM could theoretically attempt to launch a smartphone using only a "forked" version of Android, the market outcomes shown above indicate that doing so does not make economic sense. An OEM attempting to do so would risk losing access to all or virtually all of the market(s) that it currently serves outside of China. [redacted][52] Google's website cautions developers against using Android's open-source geolocation software, informing developers that they are "strongly encouraged" to use the Google Android version instead.[53] As one industry analyst put it, "Google has worked to make Android functionally unforkable."[54]

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52. GOOG-PLAY-000457086.R at -099.R ([redacted]; GOOG-PLAY-000128863.R at -876.R (same statement in slide deck dated May 2019).

53. Android, *android.location*, developer.android.com/reference/android/location/package-summary ("This API is not the recommended method for accessing Android location. The Google Location Services API, part of Google Play services, is the preferred way to add location-awareness to your app. It offers a simpler API, higher accuracy, low-power geofencing, and more. If you are currently using the android.location API, you are strongly encouraged to switch to the Google Location Services API as soon as possible.").

54. *Neither Microsoft, Nokia, nor anyone else should fork Android. It's unforkable.*, ARS TECHNICA, (February 8, 2014), arstechnica.com/information-technology/2014/02/neither-microsoft-nokia-nor-anyone-else-should-fork-android-its-unforkable/. *See also* Ron Amadeo, *Google's iron grip on Android: Controlling open source by any means*

19. The functionality and user enjoyment derived from a mobile device is highly dependent upon the range and quality of apps available on it. In addition to producing a mobile operating system, Google has created a distribution channel for delivery of Android-compatible Apps developed by third parties, and it has developed its own universe of Apps, for Google Android. Indeed, Google has developed (or acquired) some of the most popular Android- and iOS-compatible apps, including Google Search, Google Maps, Chrome, YouTube, and Gmail.

20. When purchased by the consumer, mobile devices come pre-loaded with a variety of Apps pre-positioned on the device's "home screens," each of which is accessed by swiping your thumb. The first screen is known as the "default home screen." Because pre-loaded Apps—whether on the home screen or otherwise—are automatically available to all the users who purchase the device, App developers would find it advantageous to have their Apps pre-installed by the OEMs (though, as detailed below, preinstallation is not an option for the majority of developers).[55] Similarly, the placement of an App in a prominent place on a device's home screen makes it more likely that consumers will open and engage with it, meaning the initial icon placement can strongly influence an App's overall usage and popularity.[56] Pre-installation and default placement of pre-loaded Apps are significant factors in determining an App's adoption by consumers and the App's ultimate success. Behavioral economists have shown that consumers are more likely to accept an option when it is offered as a default. For example, individuals are more likely to contribute to 401(K) retirement plans when enrollment is automatic, as opposed to requiring employees to opt into the plan.[57] According to a Google Play Competitive Usage Survey, [redacted][58]

21. In addition to proprietary Google Apps and Apple apps, a broad universe of apps are created for both operating systems by independent software developers. However, the Android and Apple operating systems are not compatible, meaning that software developers must create different versions of their apps to operate on each system. For the vast majority of developers, expending the time and resources necessary to create an app for a particular operating system depends upon the number of consumers using a device running that operating system. Given the

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necessary, ARS TECHNICA (July 21, 2018), arstechnica.com/gadgets/2018/07/googles-iron-grip-on-android-controlling-open-source-by-any-means-necessary/ ("Android is open—except for all the good parts."). *See also* GOOG-PLAY-004338386 at -388—389 ([redacted]). AOSP stands for Android Open Source Project. *See* source.android.com/.

55. *See, e.g.,* GOOG-PLAY-010801568 at -570 ([redacted]); GOOG-PLAY-001404176 ([redacted]).

56. *See, e.g.,* GOOG-PLAY-006355073 [redacted]).

57. Brigitte Madrian & Dennis Shea, *The power of suggestion: Inertia in 401 (k) participation and savings behavior* 116(4) THE QUARTERLY JOURNAL OF ECONOMICS 1149-1187 (2001). *See also* RICHARD THALER & CASS SUNSTEIN, NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS (Yale University Press 2008).

58. GOOG-PLAY-001886111.R at -119.R.

reach of Google Android and Apple iOS devices, most large developers currently create and provide apps for both systems.[59]

22. When a consumer makes an initial purchase of a mobile device, Google Android devices (manufactured by OEMs such as Samsung) and Apple devices may compete with one another for some users, but this competition is limited significantly by differences in pricing, features, and customer bases.[60] Moreover, once a consumer has elected to purchase a mobile device using either Google Android or Apple iOS, a range of factors effectively lock them in to that ecosystem, both for that device and even when purchasing replacement devices in the future. For example, because the two ecosystems are incompatible, paid apps cannot be transferred by a user from one system to another. Users may incur investments in time and money to identify, purchase, and install apps and content, including games, music, and videos, that may have to be repurchased or reinstalled upon switching operating systems.[61] Users may also risk the loss of important data such as contacts, calendars, and photos.[62] Economic analysis and standard economic tests for market definition show that the market for Android Apps and for the distribution of those Apps is distinct and separate from the market for app distribution on Apple's proprietary iOS.[63]

OVERVIEW OF ANALYSIS

23. Google Android has attained a share of over 99 percent of the market for licensed mobile device operating systems outside of China.[64] For OEMs that have manufactured mobile devices, Google Android is the licensed operating system of choice. These OEMs cannot install Apple's iOS on their mobile devices because Apple does not license its operating system, preferring to manufacture its own devices. And since Apps are neither interoperable nor transferable across the Android and iOS systems, there exist distinct markets for app distribution within each of the two operating systems. Once a consumer has selected the Google Android mobile device ecosystem through the purchase of an initial device, the consumer is "locked-in" to the Google Android ecosystem, and Apple does not meaningfully constrain Google's pricing for the distribution of Android Apps.[65]

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59. *See, e.g.,* Appendix 9, showing that [redacted] Apps in the Play Store are also available in the Apple App Store.

60. *See* Part I.A.1.b below (discussing customer lock-in).

61. *Id.* Apple does not guarantee even that all free Apps will be ported. *See* Apple, *Move from Android to iPhone, iPad or iPod touch*, support.apple.com/en-gb/HT201196 ("Here's what gets transferred: contacts, message history, camera photos and videos, photo albums, files and folders, accessibility settings, display settings, web bookmarks, email accounts and calendars. If they're available on both Google Play and the App Store, *some of your free Apps* will also be transferred. After the transfer is complete, you can download any free Apps that were matched from the App Store.") (emphasis added). Likewise, Google's own Pixel switching service cannot transfer paid Apps from iOS. *See* GOOG-PLAY-004147888 at -897; Pixel Phone Help, *Transfer Data from an iPhone to a Pixel,* support.google.com/pixelphone/answer/7129740#what_doesnt_copy&zippy=%2Cwhat-wont-copy-during-setup ("What won't copy during setup" includes "Paid Apps" and "Unpaid Apps not matched on the Play Store").

62. *See* Part I.A.1.b below (discussing customer lock-in).

63. *See* Parts II.A and III.A below.

64. *See* Figure 4 above.

65. *See* Part I.A.1, *infra*. Although consumers can switch to different ecosystem when purchasing a new phone, competition in that dimension is insufficient to constrain Google from imposing anticompetitive take rates on developers.

24. To pre-install the Google Mobile Services suite of Apps and interfaces on their own devices, and to qualify for millions of dollars in search-related revenue sharing payments from Google, OEMs must enter into a licensing agreement with Google. The Play Store, formerly known as Android Marketplace, is part of Google Mobile Services and is an "App store" that provides consumers with a range of Apps[66] they can download and use on their Android devices. An App store is a two-sided platform: on one side, developers offer Apps for download and purchase, while on the other side, consumers search for and purchase Apps to download to their devices. Such two-sided platforms are characterized by what economists call "indirect network effects," meaning that the value of the platform to the users on one side is increased when there are more users on the other side of the platform. Here, the value of an App store to consumers is increased when more developers offer more Apps on the platform.[67] In turn, the value of an App store to developers is increased when there are more consumers utilizing the store to search for and download Apps. Indeed, Google's internal documents and depositions taken to date reveal that [redacted].[68]

25. In October 2008, when Google launched its Android Market App store, Google's primary goal was to ensure adoption of Google Android by the array of OEMs and carriers that previously provided their own branded devices with differentiated software and operating systems[69]—and by extension, consumers choosing Android devices over Apple and Blackberry devices. By diverting a significant portion of the funds earned from its take rate charged to developers as well as advertising revenues to carriers and certain OEMs, Google dissuaded those carriers and OEMs from establishing or pre-installing on these devices any rival App stores that might have competed with the Play Store.

26. Although Android App developers have consistently kept 70 percent of the proceeds of all App sales and the sale of In-App Content, the distribution of the remaining 30 percent has changed over time. As shown in Figure 1 below, in earlier years, before Google acquired monopoly power in the Android App Distribution Market, Google retained, at most, [redacted][70] This

66. Apps must be configured to run on a device's operating system as "native Apps," which are Apps that run directly on a device's OS; this means that they must be specifically tailored for each OS. In contrast to web-based Apps and game-streaming services, native Apps do not necessarily need an Internet connection to function after the App has been installed on a user's device. *See also* Emily Stevens, *What is the Difference Between a Mobile App and a Web App?*, CAREERFOUNDRY, (September 7, 2021), careerfoundry.com/en/blog/web-development/what-is-the-difference-between-a-mobile-app-and-a-web-app/.

67. Google's documents recognize this. *See, e.g.,* GOOG-PLAY-004490904.R at -905.R ([redacted]).

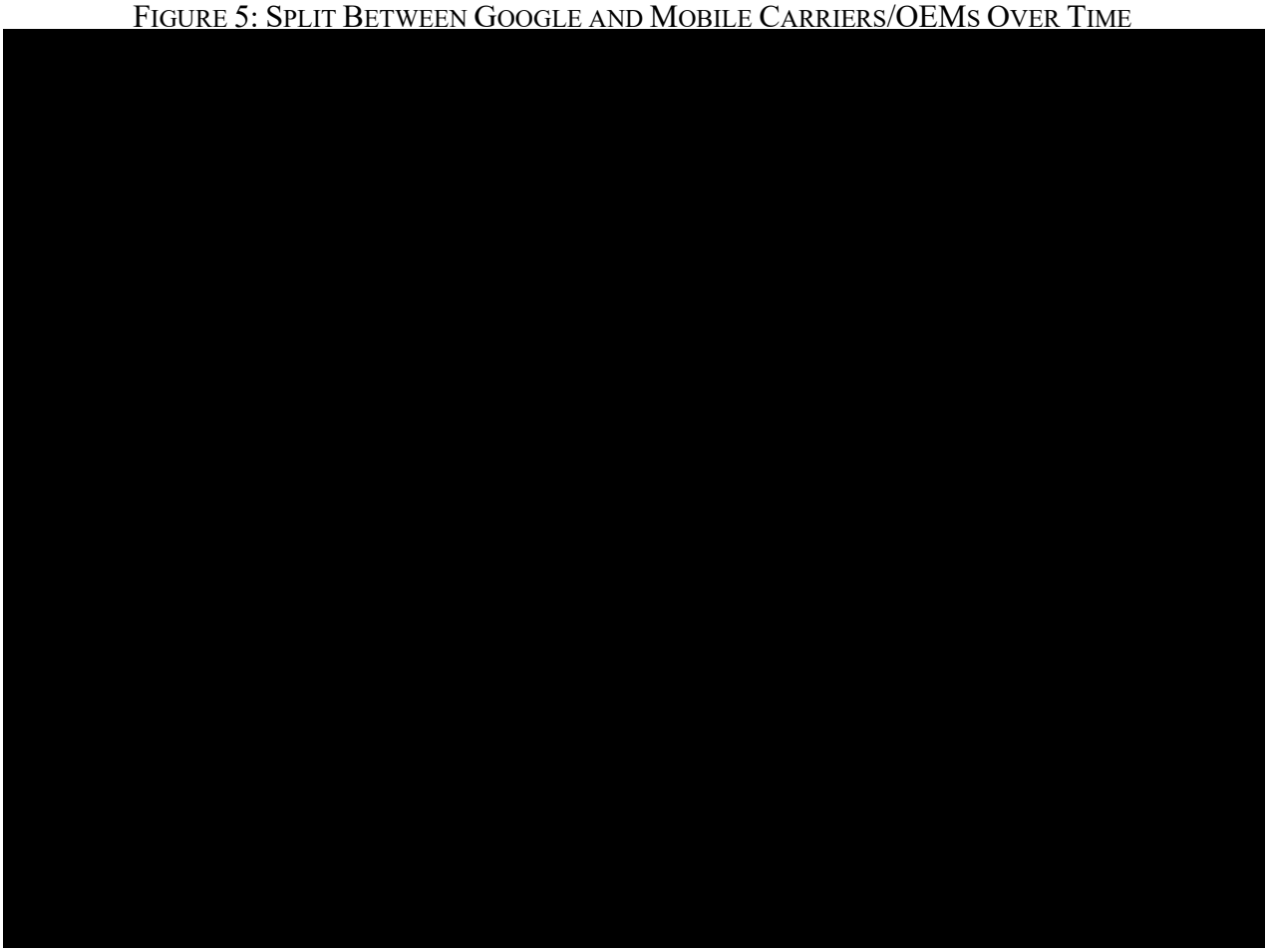
68. GOOG-PLAY-007317611 at -614-615 ([redacted]). *See also* Deposition of Lawrence Koh (Dec. 9, 2021) [hereafter Koh Dep.] at 321:19-323:1; 324:6-12 ([redacted]).

69. *See* Part IV.A.1, *infra*.

70. [redacted]. In the United States, the carriers control the device's client ID in nearly all cases, and

created an incentive which would entrench the Play Store on more mobile devices and discourage the initiation and success of competing App stores. Google's witnesses have testified that [redacted]. Once the Play Store attained significant penetration and user adoption, Google reduced the carriers' share of the take rate and ultimately terminated its revenue-sharing agreements with the mobile carriers.

FIGURE 5: SPLIT BETWEEN GOOGLE AND MOBILE CARRIERS/OEMS OVER TIME



Source: GOOG-PLAY-000443763.R at -722.R.

The Android App Distribution Market

27. The Play Store is Google's two-sided platform for bringing together developers and consumers, allowing developers to sell and distribute Apps and consumers to purchase Apps for use on their Android devices. In addition to providing matchmaking between consumers and developers, other functions in the Android App Distribution Market include, but are not limited

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accordingly received revenue sharing. GOOG-PLAY-007847148 (Deposition of Jamie Rosenberg (July 14, 2020) in *In re Google Antitrust Litigation*) [hereafter Rosenberg Dep.] at 126:10-129:9.

71. Deposition of Eric Chu (Dec. 20, 2021) [hereafter Chu Dep.] at 84:10-88:7 [redacted]).

to, auto-updating and storage. With the exception of China, where the Play Store is blocked,[72] "Apple and Google control more than 95 percent of the [a]pp store market share through iOS and Android…The [a]pp economy was built on these two platforms[.]"[73] Due in part to the massive installed base of Android mobile devices, the Play Store accounts for more than three times as many downloads as the Apple App Store worldwide—despite the Play Store's absence from China.[74]

28. The Android App Distribution Market is a relevant product market that is distinct, not only from Apple's iOS app distribution market, but also from the markets for web-based apps and distribution channels for applications for PCs or gaming consoles. Given the widespread distribution of the Play Store on Google Android devices throughout the world, developers of Android-compatible Apps, wherever they are located, have strong incentives to list their Apps for distribution on the Play Store. The global reach of the Play Store and the developers who seek to distribute their Apps through it, thus makes the relevant geographic market for the Android App Distribution Market global, except for China, where the government prefers Chinese providers of both mobile devices and operating systems.[75]

29. Direct and indirect evidence establishes that Google has market power in the Android App Distribution Market. Google's 30 percent take rate is high relative to competitive benchmarks, yet the vast majority of Apps are downloaded through the Play Store. As a two-sided platform, the Play Store benefits from indirect network effects, which serve to entrench its market share with developers. Given the Play Store's reach with consumers gained and maintained through the Challenged Conduct, which has also substantially foreclosed alternative channels for Android Apps, developers effectively must list their Apps on the Play Store and agree to its restrictive conditions, which in turn act as substantial barriers to entry for effective competition from rival App stores.

30. Google has provided inducements, imposed a variety of restrictions, and erected various technological barriers to substantially foreclose rival App stores and the direct downloading of Apps. It has done so to achieve and maintain its market power in the Android App Distribution Market. More specifically, Google has engaged in the following conduct in the Android App Distribution Market:

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72. VPNDada, *How to Access Google Play Store in China*, vpndada.com/access-google-play-store-china/ ("If you buy an Android phone in China today, you won't find the Google Play App store pre-installed on that phone. Instead, depending on the brand of the phone, it will come with some other App stores, mostly likely one offered by a Chinese company.").

73. David Curry, *App Store Data (2022),* BUSINESS OF APPS, (Jan. 11, 2022), businessofApps.com/data/app-stores/ ("Outside of China, Apple and Google control more than 95 percent of the App store market share through iOS and Android, respectively. . . The App economy was built on these two platforms, which have expanded their offerings to include Apps for consumers and every type of business.").

74. *See, e.g.,* Sensor Tower, *2021 – 2025 Mobile Market Forecast,* (2021) at 7, go.sensortower.com/rs/351-RWH-315/images/Sensor-Tower-2021-2025-Market-Forecast.pdf (showing 109 billion Play Store App downloads worldwide in 2020, compared with 34 billion App downloads in the Apple App Store).

75. GOOG-PLAY-004253884 at -894 [redacted].

a. *Financial Inducements*: Google achieved its power in the Android App Distribution Market by making payments that incentivized carriers (and OEMs) to distribute Google Android mobile devices and dissuaded (and in some cases prevented) them from developing, promoting, or offering alternative App stores, including their own stores. Google was [redacted] once power was achieved, Google dramatically reduced or eliminated these payments.

b. *Bundling of Apps and APIs*: Google requires OEMs to pre-install and prominently place the Play Store on all Google Android devices as a contractual condition of licensing GMS, which includes Google's most popular Apps, including Google Maps, YouTube, Chrome, Google Search, and Gmail. OEMs must also install this bundle of Apps to gain access to crucial programming interfaces necessary for many common Android Apps to properly function. The Play Store's prominent position inhibits competition from competing App stores.

c. *Anti-steering Restrictions*: Google's agreements with App developers prohibit developers from steering users within the App to other App stores, platforms, or websites to purchase or download Apps.[76]

d. *Tie of YouTube, Google Search, and Play Store Advertising to the Play Store*: App developers' access to valuable advertising opportunities on YouTube and Google Search is only available for Apps distributed through the Play Store.

e. *Substantial Financial Inducements to Large Developers in Return for MFN Provisions*. Faced with the prospect of potential competition from other App stores (including the potential for large developers to create their own App stores), Google offered large financial inducements to large developers in order to secure contractual commitments that they would not provide unique content to Google competitors. Google called this program "Project Hug," and it was designed to "mitigate" the risk of competition.

f. *Revenue Agreements in Exchange for Exclusivity Provisions:* Google's recent agreements with OEMs [redacted].

g. [redacted]. I also understand that

76. *See* Google Play Payments Policy, §4, https://support.google.com/googleplay/android-developer/answer/9858738?visit_id=637994598201252840-4239604614&rd=1.

Google has attempted to prevent (and may have succeeded in preventing) [redacted]. I am not opining on the existence of such agreements. Nevertheless, if there were such agreements, they would very likely have generated anticompetitive effects.

h. *Technical Barriers*: Google imposes default settings and warnings that make it unnecessarily difficult for users to download rival App stores and Apps from rival App stores or from developer websites, and auto-updating functionality is limited to the Play Store and certain pre-installed Apps.

31. Google's conduct suppresses the development of competing App stores and the distribution of applications outside of Google Play. Google's conduct has substantially foreclosed critical distribution channels for competitors, raised barriers to entry in the Android App Distribution Market, and prevented the use of alternative In-App Aftermarket providers. For example, multi-homing—the use of alternative App stores on the same device—would occur more extensively in the absence of Google's restraints. In a more competitive world, steering by altering the relative price of initial downloads of Apps would allow developers to direct consumers to lower-priced alternatives, including direct downloads from their own websites or competing App stores that charge lower take rates.

32. In the absence of Google's conduct, competition would have led to lower prices. With a combination of multi-homing and steering, developers could charge a lower price for Apps to consumers who would download Apps from a lower-cost App platform or website. This in turn would exert competitive pressure on Google to lower its own take rate.

The Aftermarket for Services in Support of Consummating Purchases of In-App Content

33. Following the download and installation of an App, developers may offer to the consumer digital content related to the App (In-App Content). The matchmaking services offered by Google in the Android App Distribution Market are distinct from the services offered in support of consummating purchases of In-App Content. The In-App Aftermarket involves transactions between developers and sellers of services, including payment processing, record keeping, and unlocking of content, needed to consummate a purchase of In-App Content. From the developer's perspective, certain functions are needed for a consumer to be able to purchase In-App Content, including billing (also present in the Android App Distribution Market) and unlocking the In-App Content on the user's phone (not present in the Android App Distribution Market). Accordingly, the developer's demand for these services in the In-App Aftermarket is derived from the consumer demand for In-App Content. Unlike the two-sided Android App Distribution Market, the In-App Aftermarket is one-sided. Indirect network effects are not present in the In-App Aftermarket. While the App developer delivers the In-App Content, because of Google's requirements an App developer cannot complete the transaction without using Google's In-App Aftermarket Service, Google Play Billing ("Google Play Billing" or "GPB"). By forcing developers to complete transactions through Google Play Billing, Google has effectively tied the In-App Aftermarket to the Android App Distribution Market and forced developers who distribute an App to a consumer through Google to forever use Google as a middleman for the consumers' purchase of In-App Content for such an App. Absent this tie-in, developers could either provide or engage third parties to provide in the In-App Aftermarket the services now provided by Google.

34. Once an App is purchased and downloaded from the Play Store, Google need not play any role in the In-App Aftermarket. I understand that Plaintiffs' technical expert, Professor Douglas Schmidt, has found that, although Google inserts itself into the In-App Aftermarket by requiring that developers use Google Play Billing, there is no technical justification for requiring developers to use Google Play Billing.[77] Similarly, while Google requires that every App downloaded through the Play Store utilize the services that Google has included in its Google Play Billing product for the sale of In-App Content, there are numerous alternatives that can provide similar features at a lower cost to developers and ultimately consumers. The economic evidence demonstrates separate demand for In-App Aftermarket services.[78]

35. Google maintains market power in the In-App Aftermarket by requiring developers to use Google Play Billing to support the purchase of all In-App Content. Google utilizes Google Play Billing to impose a take rate generally of 30 percent—the same take rate it commands in the Android App Distribution Market—on all purchases of In-App Content for that App, forever. The In-App Aftermarket is a distinct relevant market, and in the but-for world, developers could select from among many potential competitors (or deploy a vertically integrated solution) to support the purchase of In-App Content. This is evidenced by Google's prohibition on developer steering of consumers to outside channels, the ability of more powerful developers to bypass Google Play Billing, Google's efforts to incentivize these developers to transact through Google Play Billing, and by separate demand for services in the In-App Aftermarket. The geographic In-App Aftermarket is global, except for China, as third party In-App Aftermarket service providers could provide cross-border global services.

36. Direct and indirect evidence establishes Google's market power in the In-App Aftermarket. Google's standard 30 percent take rate is high compared to rates charged by potential competitors, yet [redacted] of all developers offering In-App Content utilize Google Play Billing by virtue of Google's restraints.[79] Moreover, Google routinely discriminates in price among developers, not requiring those selling physical goods through an App to utilize Google Play Billing, and, more recently, reducing its take rate on subscription sales or sales by smaller

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77. This conclusion is corroborated by the fact that Google does not require developers selling physical goods or services (such as Uber) to use Google Play Billing; Google lacks sufficient market power to impose the Aftermarket Tie-In on these developers. It is further corroborated by the fact that, in compliance with local legislation, Google now allows developers selling digital goods in South Korea to use alternatives to Google Play Billing. *See, e.g.,* Play Console Help, *Changes to Google Play's billing requirements for developers serving users in South Korea*, support.google.com/googleplay/android-developer/answer/11222040 ("As a result of recent legislation, we are now offering all developers the ability to offer an alternative in-app billing system alongside Google Play's for their mobile and tablet users in South Korea.").

78. *See* Part III.A.2 below.

79. Record evidence indicates [redacted] *See, e.g.,* GOOG-PLAY-004338990 ([redacted]).

developers, reflecting the fact that Google faces a downward-sloping demand curve among developers, a hallmark of market power.[80]

37. Google has maintained its market power in the In-App Aftermarket by imposing a variety of restrictions and offering targeted financial incentives. More specifically, Google has engaged in the following conduct in the In-App Aftermarket:

a. *Linking Play Store Access*: A developer can offer its App for sale or distribution through the Play Store, which has monopoly power in the Android App Distribution Market—only if the developer agrees to exclusively use Google Play Billing for all subsequent sales of In-App Content.

b. *Anti-Steering Restrictions*: Google contractually prohibits developers from steering customers within the App to alternative distribution and payment processing outlets for purchasing In-App Content and prohibits them from even using any customer information the developer learned through the Play Store.[81]

c. *Targeted Incentives*: Google provides large monetary incentives and advertising packages to ensure that those developers that have the resources to create alternative billing systems use GPB exclusively.[82]

38. For ease of exposition, I refer to this collection of restraints as the "Aftermarket Restrictions," and I refer to the first restriction (a) as the "Aftermarket Tie-In" or "Tie-in."[83] In the absence of the Aftermarket Restrictions, competition in the In-App Aftermarket would be robust. Developers would be able to select their own suppliers in the In-App Aftermarket from an array of competitive options and could steer consumers towards lower-priced alternatives.

The Impact of Google's Anticompetitive Conduct on Consumer Plaintiffs

39. Google's anticompetitive restrictions in the Android App Distribution Market and in the In-App Aftermarket have impaired competition in both markets. These anticompetitive restrictions have damaged U.S. Consumers by raising the prices of paid Apps and In-App Content. Absent Google's restrictions and anticompetitive conduct, competition in the distribution of applications would materialize, and developers would likewise have a choice of how to transact their In-App Content with their own users. The benefits to consumers resulting from competition could take different forms. I use a two-sided platform model with multi-homing to show that, in the absence of restraints in the Android App Distribution Market, Google would be compelled to

80. Firms that lack market power, by contrast, face a horizontal demand curve, which means they cannot influence the market price, or restrict output by raising prices.

81. *See* Google Play Payments Policy, §4, https://support.google.com/googleplay/android-developer/answer/9858738?visit_id=637994598201252840-4239604614&rd=1; GOOG-PLAY-000053875 at -876 ([redacted]).

82. When employed by a firm with monopoly power, a loyalty rebate or bundled loyalty discount can foreclose rivals and thereby serve as a restraint on trade. *See, e.g.*, Patrick Greenlee, David Reitman, and David S. Sibley, *An antitrust analysis of bundled loyalty discounts*, 26 INT'L J. INDUS. ORG. 1132, 1135, 1137-38 (2007).

83. The Aftermarket Tie-In can also be analyzed through the lens of exclusive dealing. *See, e.g.,* Kevin Caves & Hal Singer, *Assessing Bundled And Share-Based Loyalty Rebates: Application To The Pharmaceutical Industry* 8 JOURNAL OF COMPETITION LAW & ECONOMICS 889, 892-895 (2012).

lower its take rate from developers. I show that a portion of the savings to developers from a take rate reduction would be reflected in lower consumer prices.

40. Next, I use the Discount Model to demonstrate how Google would respond to greater competition by increasing direct consumer discounts. I also calculate aggregate damages using the Amazon Appstore as a benchmark. The Amazon Appstore operates in the same market as the Play Store, distributing Apps on Google Android devices. But unlike the Play Store, the Amazon Appstore lacks monopoly power, and competes on the merits by offering direct customer discounts of [redacted] to those who access the Amazon Appstore on Google Android devices. The Play Store's ability to offer comparatively meager customer discounts of less than [redacted] without losing significant market share to Amazon reflects the market power conferred by the Challenged Conduct.

41. The remainder of the report is organized as follows. In Part I, I demonstrate that there is a relevant antitrust market for licensed mobile operating systems, and I demonstrate that Google has monopoly power in that market. In Parts II and III, I demonstrate that the Android App Distribution Market and the In-App Aftermarket are distinct relevant antitrust markets and that Google wields monopoly power in each. In Part IV, I describe the restraints imposed by Google in the Android App Distribution Market, and I demonstrate that these restraints have anticompetitive effects and substantially foreclosed competition. In Part V, I perform a similar analysis for the In-App Aftermarket. In Part VI, I demonstrate the anticompetitive injury flowing from Google's anticompetitive conduct in the relevant markets at issue. In Parts VII and VIII, I estimate aggregate damages to U.S. Consumers, and I demonstrate how injury and damages are calculated for individual U.S. Consumers.

I. GOOGLE'S MONOPOLY POWER IN THE MARKET FOR LICENSED MOBILE OPERATING SYSTEMS

42. My economic analysis encompasses several relevant antitrust markets. The first is the relevant market for licensed mobile operating systems, defined as mobile OSs that are available to be licensed to entities other than the owner of the mobile OS. Mobile device OEMs must either develop their own operating system or license an operating system from a third party. Apple is the only significant device manufacturer to develop and maintain its own operating system, iOS, which works exclusively on Apple devices. For all other OEMs, Google is the dominant provider of licensed mobile device operating systems. Outside of China, Google Android accounts for virtually 100 percent of all licensed mobile operating systems.[84] Google dominates this market through its control of the Google Android operating system.

43. Many of the same economic factors that inform the definition of the relevant antitrust market for licensed mobile operating systems also inform the other two relevant antitrust markets at issue here. The barriers to substitution between iOS and Google Android, analyzed in Part I.A.1 below, also confer market power to Google in the Android App Distribution Market and the In-App Aftermarket. The same holds true for the inability of technologies such as PCs and gaming consoles to discipline Google's market power, reviewed in Part I.A.4 below.

84. *See* Figure 3A above.

A. There is a Distinct Relevant Antitrust Market for Licensed Mobile Operating Systems

44. A (not so) hypothetical monopolist over Google Android could profitably exercise market power over OEMs, due to a lack of economically viable competing OSs to whom the OEMs could switch in response to an exercise of market power by Google Android.[85] As detailed below, Google's monopoly in licensed mobile operating systems is well-established and is demonstrated through both direct and indirect methods.

1. Apple's iOS Is Not In the Relevant Antitrust Market for Licensed Mobile Operating Systems

a. OEMs Cannot License Apple's iOS

45. Apple does not license its iOS to any other OEM. Thus, from an OEM's vantage, iOS is not a substitute for licensed mobile operating systems. In terms of the test for market definition in the *Horizontal Merger Guidelines*, a small, but significant, non-transitory increase in price (a "SSNIP") by a hypothetical monopolist of licensed operating systems could not induce any OEM to install iOS instead, as Apple will not grant such a license.[86]

b. Customer Lock-In, Distinct Pricing and Features, and Distinct Customer Bases Insulate iOS and Google Android from Head-To-Head Competition

46. Consumers are the ultimate source of demand for smartphones, and anticompetitive conduct in the market for mobile OSs is harmful to consumers. In a competitive market, consumers might respond to an exercise of market power by Google Android by switching to iOS. In reality, consumers face a range of barriers that make this impracticable, as detailed in this section.

47. Consumers cannot switch between iOS and Android OSs without switching devices. For example, a user with an Apple iPhone cannot obtain Apps from the Play Store (or from any other Android App store), and a user with an Android phone cannot download Apps from

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85. *See, e.g.,* Department of Justice & Federal Trade Commission, *Horizontal Merger Guidelines* (2010), §4.1.1.

86. The court in *Epic v. Apple* found that the relevant market for Epic's gaming-centric complaint was the "mobile gaming market," which included iOS and Android mobile devices. There the court followed the factors from *Newcal Indus., Inc. v. Ikon Office Sol.*, 513 F.3d 1038, 1049-50 (9th Cir. 2008), which are divorced from economic teachings, to reject a single-product aftermarket. In particular, there is no economic requirement that consumers be duped in order to be locked into the Android operating system and then beholden to a provider in the Android App Distribution Market. Lock-in is not an information problem. Movie patrons who pay supra-competitive prices for popcorn, or hotel guests who pay supra-competitive prices for movie rentals are not duped; they simply do not wish to incur the costs of leaving the movie theater (or hotel) to find a cheaper substitute for the ancillary product. Much of Google's anticompetitive conduct is unknown to consumers: The OEM provisions are confidential, as are Google's anticompetitive payments to carriers and OEMs. *See also* Rachel Rickard Straus, *Apple faces landmark legal claim that could pay out to millions: Rip-off that adds 30% to price of smartphone Apps*, THIS IS MONEY (Dec. 11 2021), thisismoney.co.uk/money/bills/article-10299235/Rip-adds-30-price-smartphone-Apps html ("Most customers do not realise they are in effect paying huge commissions. But claimants say Apple and Android users have no alternative so Apple and Google can effectively charge what they like."). But even if consumers had been fully aware of the Challenged Conduct, the impact of such restraints are simply baked into the price of Apps and In-App Content, which consumers are obliged to pay given the lack of competitive alternatives. In any case, to the extent *Newcal* (improperly) requires information asymmetries between the wrongdoer and the ultimate consumer for the existence of an aftermarket, the evidence shows that the markets in this case are characterized by such asymmetries.

the Apple App Store. Although Google Android mobile devices may sometimes compete with Apple devices with respect to the initial choice of a device (and the associated OS ecosystem), the competition is limited by differences in pricing, features, and customer bases. Android and iOS compete for different users at different price points; Android smartphones are considerably less expensive than iPhones. In the United States Android smartphones are priced, on average, at less than half of the price of an iPhone.[87] Worldwide, the price discrepancy is even greater.[88] Not surprisingly, this means that Android and iOS compete for different bases of users. A 2021 Google analysis of recent U.S. smartphone purchasers found that [redacted][89] One industry analysis found that iPhone users in the United States earn substantially more than Android users, and that iPhone users also spend about twice as much per month on technology, compared with Android users.[90] Android smartphones also encompass a greater range of devices, compared with iOS, which offers a more limited selection of higher-end devices.[91]

48. Once a user selects either a Google Android or iOS device, that user is largely locked in, because the costs of switching from one OS to another are substantial. Economists recognize that switching costs and customer lock-in confer "lucrative ex post market power."[92] Economists have documented substantial switching costs between mobile operating systems, including between Android and iOS. In a 2021 study published in the *Journal of Industrial*

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87. Amit Chowdhry, *Average iPhone Price Increases To $687 and Android Decreases To $254, Says Report*, FORBES (Feb. 3, 2015), forbes.com/sites/amitchowdhry/2015/02/03/average-iphone-price-increases-to-687-and-android-decreases-to-254-says-report/?sh=d9bcd17539e4.

88. *Id.*

89. GOOG-PLAY-011119640 at -643, -651. [redacted]. *Id.* at -656. A corporate designee testifying on behalf of Google confirmed that, [redacted]

90. *See* Slickdeals, *iPhone Users Spend $101 Every Month on Tech Purchases, Nearly Double of Android Users, According to a Survey Conducted by Slickdeals*, CISION PR NEWSWIRE (Oct. 30, 2018), prnewswire.com/news-releases/iphone-users-spend-101-every-month-on-tech-purchases-nearly-double-of-android-users-according-to-a-survey-conducted-by-slickdeals-300739582.html?c=n ("iPhone users make an average salary of $53,251 and are more likely to splurge on commodity items than those with Androids. On the contrary, Android users make an average salary of $37,040, making it a plausible reason as to why they may be drawn to the cheaper prices of Android products.").

91. *See, e.g.,* Steven J. Vaughan-Nichols, *iPhone vs. Android: How to choose the best smartphone for you*, COMPUTERWORLD (Mar. 3, 2022), computerworld.com/article/2468474/iphone-vs-android-which-is-better-for-you.html ("With iPhones, the operating system and the hardware are tied at the hip. With Android phones, it's a different story. There is such an enormous difference between Android smartphones that comparing an iPhone 13 with, say, and excellent budget Android smartphone, such as 2020's Moto G Power, is like comparing apples (ahem) and oranges.").

92. *See, e.g.,* Joseph Farrell & Paul Klemperer, *Coordination and Lock-In: Competition with Switching Costs and Network Effects* 3 HANDBOOK OF INDUSTRIAL ORGANIZATION 1970-2056, 1970 (2007) ("Lock-in hinders customers from changing suppliers in response to (predictable or unpredictable) changes in efficiency, and gives vendors lucrative ex post market power – over the same buyer in the case of switching costs (or brand loyalty), or over others with network effects."). *See also* Paul Klemperer, *Markets with Consumer Switching Costs*, 102(2) Q. J. ECON. 375 (1987).

Economics, the authors "find that there are significant switching costs between [mobile] operating systems and brands[.]"[93] When translated into monetary terms, the cost of switching from Android to iOS is estimated at between €391 and €441.[94] Switching costs are likely even higher for many consumers, given that the authors' methodology obliges them to "use only observations for consumers who switch handsets and who therefore must have lower switching costs than others."[95]

49. Google's internal data shows that [redacted] One Google survey conducted between December 2019 and January 2020 found that [redacted][96] Given that most users do not purchase a new device every year, [redacted] of Android users switch from Android OS annually.[97] Independent analyses have found that Android users display a high degree of brand loyalty (measured as the percentage of customers that remain with their existing OS when activating a new phone) at around 89 to 91 percent in 2017.[98] One 2021 survey found that less than 20 percent of Android users were willing to even consider switching to an iPhone 13, let alone actually make the switch.[99] According to one Google document, of those that did purchase a new Android device in 2018, [redacted].[100] A June 2020 [redacted] presentation observed that [redacted]"[101] The presentation summarized the data as follows: [redacted]"[102]

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93. Lukasz Grzybowski & Ambre Nicolle, *Estimating Consumer Inertia in Repeated Choices of Smartphones* 69(1) J. INDUS. ECON. 33, §5.2 (2021).

94. *Id.* at Figure A.2.

95. *Id.* §5.2.

96. GOOG-PLAY-000277908.R at -913.R-914.R. Another Google study in 2016 found that [redacted]. *See* GOOG-PLAY-000572041.R at -2048.R. [redacted]. *See* GOOG-PLAY-004556784.R at -793.R (Q3 2018 marketing analytics); GOOG-PLAY-005705974.R at -985.R (Q4 2019 marketing analytics). Another 2017 Google presentation [redacted]. *See* GOOG-PLAY-001558912.R at -919.R.

97. GOOG-PLAY-007745710 at -722 ([redacted]).

98. Consumer Intelligence Research Partners, LLC, *Mobile Operating System Loyalty: High and Steady* (Mar. 8, 2018), files.constantcontact.com/150f9af2201/4bca9a19-a8b0-46bd-95bd-85740ff3fb5d.pdf ("Android has a 91% loyalty rate, compared to 86% for iOS, measured as the percentage of customers that remain with each operating system when activating a new phone over the twelve months ending December 2017."); Lucas Mearian, *iOS vs. Android: When it comes to brand loyalty, Android wins*, COMPUTERWORLD (Mar. 9, 2018), computerworld.com/article/3262051/ios-vs-android-when-it-comes-to-brand-loyalty-android-wins html.

99. *See, e.g.*, Abhin Mahipal, *Survey: 18% of Android users would consider switching to iPhone 13, but this is down 15% from last year*, SELLCELL (Aug. 31, 2021), sellcell.com/blog/survey-18-percent-of-android-users-would-consider-switching-to-iphone-13/. A 2020 survey found that 33 percent of existing Android users would consider switching to an iPhone 12. *See* Abhin Mahipal, *Survey: 3 in 10 Android Users Would Consider Upgrading to iPhone 12*, SELLCELL (Oct. 5, 2020), sellcell.com/blog/survey-3-in-10-android-users-would-consider-upgrading-to-iphone-12/ . It bears noting that being open to considering switching is not the same actually switching.

100 GOOG-PLAY-011269729 at -770.

101.GOOG-PLAY-011128192 at -197 (emphasis in original).

102.GOOG-PLAY-011128192 at -194.

50. Because apps are neither interoperable nor transferable, a user switching from a Google Android device to an iOS device cannot transfer all apps to a new phone. The user must re-download and install apps, and may need to find substitutes for apps not available on the new OS. Users may need to repurchase paid apps and any in-app content, and may end up losing their app-related data if unable to transfer it.[103] Transferable app data and customization settings must be transferred to the new device as well, a process that entails additional time and effort.[104] Users may also need to cancel subscriptions and re-subscribe when switching to a new OS.[105]

51. Users report losing the data on their devices and the difficulty of learning a new brand or OS as two top concerns related to switching.[106] Even if the user understands how to transfer data, the process is typically time-consuming and labor-intensive. Transferring from an iOS to an Android device, for example, "involves an average of 40 steps and can take as long as 9 hours" under some circumstances.[107] In studying this switching process, Google observed that [redacted][108] After transferring their data, users must then undertake the process of learning the new OS. As one Google study explained, [redacted]"[109] The costs associated with learning a new OS contribute further to switching costs.[110]

52. Still other factors contribute to switching costs. Once a consumer has grown comfortable with one brand, switching may be perceived as a source of discomfort.[111] A 2017 presentation titled "Switching to Pixel" describes [redacted][113] Google recognizes that

103. Nabila Amarsy, *Switching Costs: 6 Ways to Lock Customers Into Your Ecosystem*, STRATEGYZER (July 27, 2015), strategyzer.com/blog/posts/2015/7/27/switching-costs-6-strategies-to-lock-customers-in-your-ecosystem ("The 'Data trap'… encourages customers to create or purchase content or Apps that are exclusively hosted on a platform.").

104. *Id.* In addition, I understand that Professor Presser concludes based on his survey analysis that "A large majority believes such a switch would require more than a little effort or would lead to worry about losing access to photos, phonebooks, or other things now on the Android phone." Expert Report of Dr. Stanley Presser (Oct. 3, 2022) [hereafter, "Presser Report"] at 11.

105. Economists recognize that firms in ancillary markets or aftermarkets may wield power even when the forward market is competitively supplied. For a review of the literature, see Hal Singer & Andrew Card, *Lessons from Kahneman's Thinking Fast and Slow: Does Behavioral Economics Have a Role in Antitrust Analysis?*, ANTITRUST SOURCE (2012), www.semanticscholar.org/paper/Lessons-from-Kahneman-%E2%80%99-s-Thinking-%2C-Fast-and-Slow-Kahneman/8abf422dc2aca5adf6fe6c20e9064863f64819dd?p2df.

106. GOOG-PLAY-000880576.R at -580.R.

107. *Id.* at -589.R.

108. *Id.*

109. *Id.*

110. Switching costs appear to accumulate with time invested in the Android device, as proxied by the age of the owner. *See, e.g.*, GOOG-PLAY-002416488 ([redacted].

111. *See* Thomas A. Burnham, Judy K. Frels, and Vijay Mahajan, *Consumer Switching Costs: A Typology, Antecedents, and Consequences*, 31(2) J. ACAD. MKT. SCI. 109 (2003).

112. GOOG-PLAY-007317466 at -467. Pixel is a Google smartphone.

113. *Id.* at -473.

the Play Store [redacted][114]

53. Users also benefit from the complementarity of multiple devices within the same ecosystem; switching ecosystems may jeopardize those benefits. As a 2020 presentation to Google's Board of Directors explained, [redacted][115] A user might use her smartphone when traveling during the day and switch to using a tablet later at night. This user would likely gain value from the ability to sync files, settings, user information, and other features among these multiple devices.[116] Many apps do not allow for this synchronization across different operating systems. Accordingly, a user may not find it worthwhile to switch ecosystems unless they switch all of their devices. Many users are thus locked into an OS in part because they are locked into an OS ecosystem. Ecosystem lock-in can be seen in data related to users' likelihood of switching ecosystems; Google has determined that Android smartphone owners who switch to iOS are [redacted][117]

54. This complementarity extends to groups of people. A household contemplating purchasing multiple devices would value the ability to integrate their apps and files—perhaps through parental controls on apps and screen time, location tracking abilities, and through family plans that allow the sharing of purchases and subscriptions.[118] To achieve this compatibility, the household would likely need to all use the same operating system, leading the household to become "locked in" to that ecosystem.[119]

55. Consumers are not typically informed at the point of purchase that approximately 30 percent of their expenditures on App or In-App Content is collected by Google, nor are they told of Google's restrictions on OEMs, carriers, and developers that result in foreclosure of competitive App stores. Instead, Google touts Android as an "open" system.[120] Without knowledge of the anticompetitive restrictions, consumers are unlikely to foresee that, by purchasing an

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114. GOOG-PLAY-004237669.R at -673.R.

115. GOOG-PLAY-001018676.R at -692.R.

116. Different operating systems offer different features for synchronizing devices. For instance, Microsoft Windows offers a "Your Phone" App which can tie together an android operated phone and computer. Similarly, Apple offers a "Continuity" feature which functions similarly for Apple products. *See* David Nield, *It's time to let your computer and phone hook up*, POPULAR SCIENCE (Feb. 16, 2022), popsci.com/phone-computer-work-together/.

117. GOOG-PLAY-000572041.R at -050.R.

118. For example, Apple's "Family Sharing" allows families to share services such as Apple Music, Apple TV+, App Store purchases, iCloud storage, and photo albums. It also allows parents to approve what their children purchase, limit their time on devices, and see their location. *See* Apple, *What is Family Sharing?,* support.apple.com/en-us/HT201060. *See also* Abdulf, *How to set up family sharing on iPhone and Android*, GIFFGAFF (July 26, 2019), giffgaff.com/blog/how-to-set-up-family-sharing-on-iphone-amp-android/ (describing the process of setting up the Google Play Family Library service).

119. Travers Korch, *How tech ecosystems lock you into costs*, BANKRATE (Sep. 30, 2014), web.archive.org/web/20210602055404/https:/www.bankrate.com/finance/smart-spending/tech-ecosystems-cost-you-1.aspx%20. [redacted]

120. *See, e.g.,* Android Open Source Project, https://source.android.com/ ("Android unites the world. Use the open source Android operating system to power your device.").

Android device, they will effectively be locked into a product that extracts supracompetitive profits every time they make a purchase.

c. Developers Have Economic Incentives to Develop Apps For Both Android and iOS, Further Insulating iOS and Google Android From Head-to-Head Competition

56. In the abstract, one could hypothesize that a developer could respond to an exercise of market power by Google Android by switching to iOS. But from a developer's perspective, iOS and Android do not compete as "either-or" substitutes. A successful developer does not have to choose between offering its app only on iOS or only on Android, just as a successful online retailer does not have to choose between selling its products only on the east coast or only on the west coast. In each case, the firm is likely better off doing both. A developer that restricted itself only to iOS would deprive itself of the revenue to be gained from accessing Android's massive installed customer base. Record evidence indicates that app developers generally do not consider Android and iOS as substitutes, and instead seek to maximize their reach across different platforms. For example, [redacted] by spend in the Play Store are also available on the Apple App Store.[121]

57. Adrian Ong, a Match.com executive, testified that [redacted] Andrew Grant of Epic testified that [redacted].[122][123]

2. Niche Mobile OSs Do Not Constrain Google Android's Market Power

58. Although there are non-Android and non-iOS mobile operating systems, they constitute an economically insignificant share of the market.[124] and there is no comparable ecosystem of apps to run on these devices. In assessing one such OS, one industry source reported that "[a]s with most alternate OSes, finding popular apps, or at the very least approximations, is a challenge."[125] An OEM attempting to develop its own non-Android OS would face these same barriers from a limited App ecosystem, and would also face the cost of developing and launching a device on a new OS.

59. The immense costs and complexities of developing a new mobile OS create barriers to entry, such that a SSNIP by a hypothetical monopolist of licensed operating systems would not plausibly induce an OEM to create its own system or a rival mobile OS developer to enter. These entry barriers have proven formidable, even to well-established and technologically sophisticated firms such as Facebook and Amazon. As the House Investigation of Competition in Digital Markets has observed, "several large technology companies have attempted and failed to leverage

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121. *See* Appendix 9.

122. Deposition of Adrian Ong [hereafter Ong Dep.], *Epic v. Apple* (20-cv-05640-YGR) at 67:23-68:02 [redacted]).

123. Deposition of Andrew Grant [hereafter Grant Dep.] at 26:12-27:3..

124. *See* Figure 4, *supra*.

125. Max Eddy & Ben Moore, *Break Away From Android and iOS: 7 Free Open-Source Mobile OSes to Try*, PCMAG (Jan. 28, 2021), pcmag.com/picks/break-away-from-android-ios-7-free-open-source-mobile-oses-to-try.

their large user bases to compete against Apple and Google in the mobile OS market."[126] Even firms with desktop operating systems such as Microsoft have failed to make significant inroads into mobile device operating systems. In January 2019, Microsoft announced that it would end support for its Windows 10 mobile operating system.[127] Windows was estimated to have spent more than $1 billion in developing and launching the Windows Phone 7.[128] Microsoft's failure is consistent with significant barriers to entry in mobile operating systems markets. Accordingly, an exercise of market power by Google in the market for licensable operating systems also would not plausibly induce an OEM to create its own system or a rival mobile OS developer to enter.

3. "Forked" Android Does Not Constrain Google Android's Market Power

60. An OEM currently licensing Google Android OS is barred from selling "forked" Android devices by Google's Android Compatibility Commitment ("ACC"), previously known as the Anti-Fragmentation Agreement ("AFA").[129] OEMs are therefore practically prohibited from responding to an exercise in Google Android's market power by developing a new Android-based OS or by licensing another Android-based OS, such as Amazon's Fire OS. Record evidence indicates that the AFAs have [redacted] According to a submission by Amazon to the European Commission, [redacted]

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126. *Majority Staff Report* at 105-107 ("Over the past decade, several large technology companies have attempted and failed to leverage their large user bases to compete against Apple and Google in the mobile OS market. Facebook and Amazon both tried to enter the market with variants of Google's Android OS. Both companies quickly exited the market because consumers were mostly accessing Facebook and Amazon content through Apps on iOS and Android devices…Companies like Mozilla and Alibaba have also attempted to enter the mobile OS market. Mozilla unveiled its Firefox OS in 2013 and exited the market altogether by 2016. In 2012, Chinese tech giant Alibaba developed a mobile OS called Aliyun for the Chinese market. However, Acer, Alibaba's hardware partner, abruptly canceled its collaboration with Alibaba before the launch of Acer's device running the OS. Over the past decade, once-competitive mobile operating systems like Nokia, BlackBerry, and Microsoft struggled to survive as Apple and Google grew more dominant, eventually exiting the marketplace altogether. BlackBerry—once a leading mobile OS developer—now licenses the BlackBerry name to TCL to market TCL's smartphones. TCL's BlackBerry phones run on Android. In the last quarter of 2016, Windows devices accounted for less than half of 1% of new smartphone sales. In 2017 Microsoft abandoned its mobile OS business, and by that time, more than 99% of all new smartphones were running on iOS or Android and market observers expressed no confidence that new competition would emerge. One key factor leading to Microsoft's withdrawal from the mobile marketplace was that developers were reluctant to develop Apps for a third mobile operating system when already building Apps for iOS and Android. These market dynamics remain in place today."). This is consistent with the evidence I have examined in this case.

127. *See* Rob Enderle, *How Microsoft failed with Windows 10 Mobile*, COMPUTERWORLD (Jan. 24, 2019), computerworld.com/article/3336057/how-microsoft-failed-with-windows-10-mobile html.

128. Kim-Mai Cutler, *Microsoft to Pay More Than Half a Billion Dollars to Jump-Start Windows Phone 7*, TECHCRUNCH (Aug. 26, 2010), techcrunch.com/2010/08/26/microsoft-half-billion-dollars-windows-phone-7/.

129. GOOG-PLAY-000416448 at -449 ([redacted]); GOOG-PLAY-000458664.R ([redacted]); GOOG-PLAY-000422837 at -838 ([redacted]); *see also* GOOG-PLAY-000127155 ([redacted]); GOOG-PLAY-000808433 ([redacted]); GOOG-PLAY-000808062 ([redacted]); GOOG-PLAY-000808451 ([redacted]); GOOG-PLAY-003604523 ([redacted]). *See also* Part IV.A.2 below (reviewing AFAs).).

[redacted].[130] In another email Amazon filed with the European Commission, a Sony executive wrote, [redacted]"[131] According to Amazon, [redacted].[132]

61. Even setting aside the AFAs, developing an Android fork would likely constitute a cost-prohibitive barrier to entry. According to Amazon, it invested [redacted][133]

4. Devices Such as PCs, Gaming Consoles, and Feature Phones Do Not Expand the Relevant Market

62. Devices such as PCs and gaming consoles also require operating systems in order to function. As explained below, these devices do not expand the relevant market for licensed mobile operating systems.[134] From a consumer's perspective, the functionality of a PC or gaming console is distinct from that of a smartphone, which explains why households commonly own two or three of these types of devices, using each technology for distinct purposes. Further, in the case of a consumer who owns an Android phone but not a console or PC, any substitution towards consoles or PCs would require the purchase of new hardware, further reducing the viability of significant defection. From a developer's perspective, the mobile, Android App ecosystem represents too large a customer segment to ignore.[135] Indeed, the sales of mobile games are roughly equal to the *sum* of sales of console and PC games.[136] Not only would developers sacrifice significant sales by walking away from the Play Store, but, for those who had not yet done so, they would also incur additional expense to write code for an Android-based App to work in a console or PC environment.

63. Smartphones are highly mobile, and are now a ubiquitous accessory of modern life. In contrast, the experience on devices such PCs and gaming consoles typically involves tradeoffs of portability in favor of larger screen sizes, greater computing power, little to no concern over

130. AMZ-GP_00001837 at -838.
131. AMZ-GP_00001840 at -855.
132. AMZ-GP_00001837 at -838.
133. AMZ-GP_00001904 at -908.
134. Deposition testimony indicates that Google's executives [redacted]

135. The value of transactions in the Play Store reached $47.9 billion in 2021. *See* Mansoor Iqbal, *App Revenue Data (2022)*, BUSINESS OF APPS (Sep. 22, 2022), businessofApps.com/data/app-revenues/ (citing App Annie and Sensor Tower).

136. WEPC, *Console Gaming Statistics 2022,* (Jan. 20, 2022), wepc.com/statistics/console-gaming/.

battery life, and little or no mobile broadband access.[137] It is therefore unsurprising that, although the vast majority of U.S. households own some combination of desktops, laptops, tablets, smartphones, and other computing devices,[138] only a small percentage are "smartphone-only."[139]

64. A 2019 industry report found that "Global audiences are spending more time on mobile."[140] The report found that mobile devices account for a high percentage of the time that consumers spend online in countries ranging from Canada (72 percent) to Indonesia (91 percent).[141] The report also found that the "Share of mobile time spent is reaching historic levels in the U.S. in key categories," finding that mobile usage accounts for 94 percent of gaming time, 92 percent of social media time, 83 percent of entertainment time.[142]

65. For some gaming applications, users can sometimes play on multiple platforms ("cross-platform" gaming), which has various components. One component is "cross-platform distribution," which refers to the availability of a given game on multiple platforms.[143] Another is the ability to play multi-player games with competitors on different platforms, referred to as "cross-play";[144] another is the ability to save gaming progress and to carry the progress across platforms, referred to as "cross-progression."[145]

66. Cross-platform gaming has not been and is not presently a significant factor in Google's pricing to developers on its Play Store. Cross-platform distribution, cross-play, and cross-progression are relatively new and emerging features in mobile games, and have not been a

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137. *See, e.g.,* Computer Hope, *Computer vs. smartphone* (November 6, 2021), computerhope.com/issues/ch001398 htm.

138. U.S. Census Bureau, *Computer and Internet Use in the United States: 2018* (April 2021), census.gov/content/dam/Census/library/publications/2021/acs/acs-49.pdf at 2 ("[I]n 2018, 92 percent had at least one type of computer," defining "computer" to include "all desktops, laptops, tablets, and smartphones as computers, along with selected computing technologies such as smart home devices and single board computers such as RaspberryPi and Arduino boards compiled from write-in responses.").

139. *Id.* (Figure 4 shows only about 8.8 percent of U.S. households had only a smartphone, referencing U.S. Census Bureau, 2018 American Community Survey, 1-Year Estimates). *See also* U.S. Census Bureau, *2018: ACS 1-Year Estimates Subject Tables - S2801 Types of Computers and Internet Subscriptions*, https://data.census.gov/cedsci/table?q=smartphone&tid=ACSST1Y2018.S2801 (showing 10,692,656 households with a smartphone and no other type of computing device, out of 121,520,180 households total; the share of smartphone-only households is therefore 8.8 percent (equal to 10,692,656/121,520,180)). *See also* U.S. Census Bureau, *Computer and Internet Use in the United States: 2016* (August 2018), census.gov/content/dam/Census/library/publications/2018/acs/ACS-39.pdf at 2 ("A small percentage of households have smartphones but no other type of computer for connecting to the Internet.").

140. Comscore, *Global State of Mobile* (2019), comscore.com/Insights/Presentations-and-Whitepapers/2019/Global-State-of-Mobile at 11 (showing the percentage of minutes spent on mobile devices versus desktop computers).

141. *Id.*

142. *Id.*

143. Jesse Lennox and Jacob Roach, *All cross-platform games (PS5, Xbox Series X, PS4, Xbox One, Switch, PC)*, DIGITAL TRENDS (June 30, 2022), digitaltrends.com/gaming/all-cross-platform-games/.

144. Epic's Vice President of Business Development Joe Kreiner explained: [redacted] Kreiner Dep. 44:5-8.

145. Weissinger Dep. 57:20-59:3 [redacted]

significant factor for most of the Play Store's history.[146] Google recognizes that [redacted].[147] Google's business strategy documents [redacted].[148] In 2020, Google characterized multi-platform gaming [redacted][149]

67. Monster Strike, at one time the highest grossing mobile game of all time, has been released only on mobile devices.[150] Google recognizes that some of the most popular mobile games, such as casual games,[151]may not be well-suited to PC or console play. Sony did not permit cross-platform play involving PlayStation consoles until September 2018.[152] As of January 2022, [redacted].[153] PUBG Mobile, the highest grossing game in 2020 and 2021,[154] does not offer cross-platform play between its mobile App and PUBG players on consoles.[155]

68. Even for games better-suited to cross-platform distribution, the developer must invest substantial resources to "port" a game developed for one platform to another. Epic spent [redacted] porting Fortnite's console game into a mobile version for release on Android.[156] And even for games that do enable cross-play, multiple factors may limit players' willingness to substitute gameplay on a mobile device for gameplay on a different platform. *First*, many games with cross-platform capabilities lack cross-progression – the ability for a user to save

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146. The opinion in *Epic v. Apple* allowed for the possibility that certain games exhibit cross-platform substitutability but concluded that these games were outliers: "However, not all games are like Minecraft or Fortnite; the market still reflects that video games are, for the most part, cabined to certain platforms that take advantage of certain features of that platform, such as graphics and processing, or mobility." Rule 52 Order After Trial On The Merits, *Epic v. Apple*, Case No. 4:20-cv-05640-YGR, at 84. Because the instant matter concerns all Apps, including non-gaming Apps, the conclusion that console and PC gaming are distant substitutes for Play Store users would be bolstered.

147. GOOG-PLAY-000231487 at -489 [redacted]

148. GOOG-PLAY4-002366557 at -562 [redacted]

149. GOOG-PLAY-006850420.

150. Adam Spannbauer, *Monster Strike Revenue Passes $7.2 Billion, Making It the Highest Earning App of All Time*, SENSOR TOWER (Oct. 2018), sensortower.com/blog/monster-strike-revenue.

151. GOOG-PLAY-006850420 at -420 [redacted]

152. Keza MacDonald, *PlayStation 4 opens up cross-platform play, starting with Fortnite,* THE GUARDIAN (Sept. 26, 2018), theguardian.com/games/2018/sep/26/playstation-4-opens-up-cross-platform-play-starting-with-fortnite.

153. Steven Allison Dep. 348:18-25 [redacted].

154. David Curry, *PUBG Mobile Revenue and Usage Statistics (2022)*, BUSINESS OF APPS (Sep. 6, 2022), businessofapps.com/data/pubg-mobile-statistics/.

155. Stefan Miguel Lopez, *Is PUBG Cross Platform?*, GAME RANT (July 13, 2021), gamerant.com/pubg-cross-platform-cross-play/.

156. Nicholas Penwarden Dep. 313:21-314:6 [redacted]).

his or her progress in the game on one platform and continue from that same point on another platform.[157] *Second*, mobile gamers may also be reluctant to engage in cross-play because of inherent disadvantages for players using a mobile device. According to Epic, even when cross-play is available between mobile devices and consoles, [redacted]"[158] [redacted][159] Google employees have also noted that [redacted][60] *Third*, limitations on "cross-wallet" capabilities limit users' ability to easily switch between mobile devices and other gameplay platforms. PlayStation announced only relatively recently (in May 2022), that it would, for the first time, allow users to use Fortnite "V-bucks" regardless of what platform they were purchased on.[161] Nintendo still blocks cross-wallet capabilities.[162] The inability to spend purchased in-App currencies across platforms further limits the appeal of transitioning between mobile games and other platforms.

69. To the extent that some users access games on both their mobile devices and their PCs, this does not imply that gaming on a PC is an economic substitute for gaming on a mobile device. If anything, they are more likely to be economic complements. For example, although some consumers have both landlines and mobile phones, this does not imply that the consumer would be willing to drop their mobile service entirely and to rely exclusively on their landline in order to avoid a price increase in their mobile service.

70. So-called "feature phones"—older devices that lack touchscreens and other key features—do not expand any of the relevant antitrust markets here. Devices such as 1990s-era "flip phones" are useful primarily for sending and receiving voice calls and text messages, along with limited Internet access.[163] Feature phones have an extremely low market share in the U.S.

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157. Weissinger Dep. 58 [redacted]

158. Kreiner Dep. 46:13-47:11.

159. *Id.* at 48:3-14.

160. GOOG-PLAY-006850420 [redacted].

161. Jason Guisao, *Fortnite V-Bucks Purchased On PlayStation Can Be Used Across All Platforms*, GAME INFORMER (May 17, 2022), gameinformer.com/2022/05/17/fortnite-v-bucks-purchased-on-playstation-can-be-used-across-all-platforms.

162. Weissinger Dep. 63:10-13 [redacted] *See also* Epic Games, *V-Bucks Purchased on PlayStation Join Fortnite Shared Wallet* (May 16, 2022), epicgames.com/fortnite/en-US/news/v-bucks-purchased-on-playstation-join-fortnite-shared-wallet ("Fortnite Shared Wallet is not currently supported by the Nintendo Switch platform, meaning V-Bucks purchased on other Shared Wallet platforms will not be usable on your Nintendo Switch and vice versa.").

163. *See, e.g.,* Adam Fendelman, *Cellphones vs. Smartphones*, LIFEWIRE (Oct. 19, 2021), lifewire.com/cell-phones-vs-smartphones-577507 ("Cellphones place and receive voice calls and send text messages. Smartphones do those things and more."). *See also* Difference Between, *Difference between Smartphone and Feature Phone* differencebetween.info/difference-between-smartphone-and-feature-phone ("Feature phone is a category of mobile phones that have minimal features and are moderately priced.").

(approximately two percent),[164] and consistently declining sales worldwide.[165] They are economically irrelevant here given that they cannot be used to distribute Apps or to purchase In-App Content.

71. As explained in Part II.A.3 below, the ability to access certain mobile games through web-based apps or game-streaming platforms does not expand the relevant market. These technologies have become available only recently, still have limited adoption, and still suffer from various technical limitations such as latency.

B. The Relevant Geographic Market Is Global (Excluding China)

72. According to standard antitrust principles, the relevant geographic market is "a region such that a hypothetical monopolist that was the only present or future producer of the relevant product at locations in that region" could profitably exercise market power.[166] None of the relevant geographic markets in the instant case include China, given that Google Play is blocked by the Chinese government.[167] A (not so) hypothetical monopolist over licensable mobile operating systems worldwide (excluding China) could profitability exercise market power over OEMs. For the reasons given in Part I.A above, OEMs could not defeat an exercise of market power by switching to iOS (which is not even licensable), or by switching to niche OSs, forked Android, or the various other alternatives reviewed in Part I.A. OEMs also could not defeat an exercise of market power by limiting their operations to China, given that there is there is (more than) sufficient demand in the global market outside of China to profitability sustain a hypothetical monopolist.

73. It is possible that a hypothetical monopolist over licensable mobile operating systems in the United States alone could profitably exercise market power over OEMs. Doing so is generally not necessary for purposes of my analysis here, given the global reach of Google's monopoly and its conduct.

C. Google Has Monopoly Power in the Distinct Market for Licensed Operating Systems

74. Market power can be shown using indirect evidence or direct evidence. Direct proof of market power relies on firm-specific information that speaks directly to a firm's ability to profitably raise prices or exclude rivals.[168] When, as is the case here, there is direct evidence that a firm has exercised market power, economists recognize that it is not economically necessary to

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164. *See, e.g.*, Emily Herbert, *Feature phones still have a place in the US market*, COUNTERPOINT (Jul. 6, 2022), counterpointresearch.com/feature-phones-still-place-us-market/.

165. *See, e.g.,* Statista, *Feature Phones – Worldwide*, statista.com/outlook/cmo/consumer-electronics/telephony/feature-phones/worldwide#revenue.

166. Department of Justice & Federal Trade Commission, *Horizontal Merger Guidelines* (2010), §1.2.

167. *See, e.g.,* Sherisse Pham, *Google now has two apps in China, but search remains off limits*, CNN BUSINESS, (May 31, 2018), money.cnn.com/2018/05/31/technology/google-in-china-files-app/index.html ("The company's own app store, Google Play, remains blocked in China[.]").

168. Herbert Hovenkamp, *Digital Cluster Markets*, 1 COLUMBIA BUSINESS LAW REVIEW 246, 272 (2022) ("By contrast, 'direct' proof relies on estimates of firm elasticity of demand, evidenced mainly by a firm's price-cost margins or output responses to price changes.[] These methodologies are capable of giving more accurate measures of market power as it is best defined, which is the ability of a firm to profit by raising its price above its costs[.]") citing 2B Phillip E. Areeda & Hebert Hovenkamp, ANTITRUST LAW ¶521 (5th ed. 2021) (forthcoming); Louis Kaplow, *Why (Ever) Define Markets?,* 124 HARVARD LAW REVIEW 437 (2010).

demonstrate market power indirectly.[169] This is particularly true in digital markets: As Herbert Hovenkamp, the co-author of a leading antitrust treatise, recently observed, "[D]igital markets are particularly susceptible to direct measurements of market power that do not depend on a market definition."[170] Nevertheless, for completeness I provide direct evidence of the Play Store's monopoly power and indirect evidence of market power in each of the relevant antitrust markets at issue here.

75. High market shares within a relevant antitrust market combined with evidence of entry barriers provide indirect evidence of a firm's market power.[171] The standard method for defining relevant antitrust products markets is the hypothetical monopolist test ("HMT").[172] The HMT requires that a relevant antitrust product market contain enough substitute products such that a hypothetical profit-maximizing firm that was the only present and future seller of those products would likely impose at least a small but significant and non-transitory increase in price ("SSNIP") above competitive levels.[173] If a candidate market contains too few substitute products for a hypothetical monopolist to profitably exercise a SSNIP, the relevant market is expanded by adding more substitute products until a SSNIP becomes profitable.[174] The exercise in market power

169. *See, e.g.,* Jonathan Baker & Timothy Bresnahan, *Economic Evidence in Antitrust: Defining Markets and Measuring Market Power in* PAOLO BUCCIROSSI, ED., HANDBOOK OF ANTITRUST ECONOMICS 1- 42 (MIT Press 2008) [hereafter Baker & Bresnahan], at 15. *See also* Aaron S. Edlin & Daniel L. Rubinfeld, *Exclusive or Efficient Pricing? The Big Deal Bundling of Academic Journals*, 72 ANTITRUST L.J. 119, 126 (2004) ("Market definition is only a traditional means to the end of determining whether power over price exists. Power over price is what matters…if power can be shown directly, there is no need for market definition: the value of market definition is in cases where power cannot be shown directly and must be inferred from sufficiently high market share in a relevant market."). *See also* PHILLIP E. AREEDA, EINER ELHAUGE & HERBERT HOVENKAMP, 10 ANTITRUST LAW: AN ANALYSIS OF ANTITRUST PRINCIPLES AND THEIR APPLICATION 267, 325–28, ¶ 1758b. (1996 & Supp. 2003); *see also* PHILLIP AREEDA, LOUIS KAPLOW & AARON EDLIN, ANTITRUST ANALYSIS: PROBLEMS, TEXT AND CASES ¶ 344 (6th ed. 2004). *See also* Merger Guidelines, §4 ("[e]vidence of competitive effects can inform market definition[.]").

170. Herbert Hovenkamp, *Digital Cluster Markets*, 1 COLUMBIA BUSINESS LAW REVIEW 246 (2022).

171. *See, e.g.*, William Landes & Richard Posner, *Market Power in Antitrust Cases*, 94(5) HARVARD LAW REVIEW 937, 938 (1981) [hereafter Landes & Posner] ("The standard method of proving market power in antitrust cases involves first defining a relevant market in which to compute the defendant's market share, next computing that share, and then deciding whether it is large enough to support an inference of the required degree of market power."). *See also* Thomas Krattenmaker, Robert Lande, & Steven Salop, *Monopoly Power and Market Power In Antitrust Law* 76 GEORGETOWN LAW JOURNAL 241 (1987).

172. Department of Justice & Federal Trade Commission, *Horizontal Merger Guidelines* (2010), §4 [hereafter, *Merger Guidelines*].

173. *Id.*

174. *Id. See also* Department of Justice & Federal Trade Commission, Horizontal Merger Guidelines, *reprinted in* 4 Trade. Reg. Rep. ¶ 13,104, at § 1.11 (1992) ("If, in response to the price increase, the reduction in sales of the product would be large enough that a hypothetical monopolist would not find it profitable to impose such an increase in price, then the Agency will add to the product group the product that is the next-best substitute for the merging firm's product . . . . The price increase question is then asked for a hypothetical monopolist controlling the expanded product group. This process will continue until a group of products is identified such that a hypothetical monopolist over that group of products would profitably impose at least a "small but significant and nontransitory" increase ["SSNIP"], including the price of a product of one of the merging firms.") *See also* Michael L. Katz and Carl Shapiro, *Critical Loss: Let's Tell the Whole Story*, ANTITRUST 49 (2003) ("The now-standard procedure for defining relevant product markets in horizontal merger cases asks whether a hypothetical monopolist controlling a group of products would find it profitable to raise the price of at least one product significantly above the prevailing level.").

contemplated in standard antitrust market definition can come in the form of a price increase or in the form of "a corresponding non-price change such as a reduction in product quality or service."[175]

76. As detailed below, Google's monopoly power in the relevant antitrust market for licensed operating systems is established through direct evidence of its ability to exclude rival mobile OSs, as well as indirect evidence of high market shares, barriers to entry, and high profit margins.

1. Direct Evidence: Ability Exclude Rivals and Raise Prices

77. Google gained power in the licensed mobile device operating system market through its acquisition of Android and partnerships with OEMs and carriers. OEMs could not license Apple's iOS to manufacture mobile devices, but Google's Android OS and its proprietary suite of mobile Apps and interfaces, Google Mobile Services, was available under license. While Android is available pursuant to an open-source Apache license, Google used the revenue-sharing agreements to attract OEMs and carriers to select Google Android. In its revenue-sharing agreements, [redacted].[176] The ability to exclude rivals—here, rival licensable operating systems that lacked a dominant search advertising business with which to fund OEMs and mobile carriers—is a hallmark of market power.[177]

78. As explained in Part IV.A.1 below, over time Google has systematically and substantially reduced the share of Google Play revenue paid to carriers and some OEMs, from [redacted] Google has also [redacted][178] Reducing the share of revenue paid to OEMs is economically analogous to a substantial and sustained increase in the price of Google Android, and constitutes direct evidence of market power in the licensed mobile device operating system market.

2. Indirect Evidence

a. High Market Share and Entry Barriers

79. Google accounts for nearly 100 percent of the market for licensed operating systems, providing persuasive indirect evidence of market power. When the market is properly limited to licensable mobile OSs, the data show plainly that smartphones with Google Android account for the vast majority of all smartphones sold with licensed operating systems, both in the U.S. and worldwide, as shown in Figure 4 above. Even if the market were (improperly) expanded

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175. *Merger Guidelines* §4.

176. *See, e.g.*, GOOG-PLAY-001184813 at -820 [redacted] By this point in time, carrier revenue shares were already [redacted] suggesting the figures would be [redacted].

177. *See, e.g.*, Richard G. Price, *Market Power and Monopoly Power in Antitrust Analysis*, 75(1) CORNELL LAW REVIEW 190, 198 (1989).

178. For example, a [redacted]. *See* GOOG-PLAY-001559464.R at -492.R; GOOG-PLAY4-003083697 at -698 (slide deck titled [redacted]).

to include iOS, there is a virtual duopoly between iOS and Android, as shown in Figures 3A-3B above.

80. Google's high share of the licensed mobile device operating systems market is protected by barriers to entry. Entry barriers in the market for mobile operating systems are steep.[179] Launching a competing mobile operating system requires developing the source code, contracting with OEMs, and convincing a critical mass of developers to write apps that are compatible with the new operating system, among other hurdles.[180] As explained in Part I.A.2 above, entry barriers have proven insurmountable even to well-established and well-capitalized technology firms such as Facebook, Amazon, and Microsoft.

81. The House Investigation of Competition in Digital Markets found evidence of significant entry barriers in the mobile operating system market, including the costs and complexities of offering "a superior product packaged in an attractive handset, as well as a fully realized suite of Apps and compatible devices comparable to what Apple and Google (and Google's hardware partners) currently offer."[181] Evidence from industry experts and investment analysts provides further confirmation of the barriers to successfully launching a competing mobile OS—even a product that "offered better features,"[182]—and noting the likelihood that Android and iOS "will continue to power nearly every smartphone around the world in the long run."[183]

82. Network effects are an economically significant entry barrier, working to the benefit of established incumbents (iOS and Google Android) while making it even more difficult for a new mobile OS to gain traction.[184] Google cemented its early market power in licensed mobile device operating systems by exploiting a natural feedback loop in which device makers adopted Android with Google Mobile Services, including Google's proprietary App distribution channel, which in turn attracted App developers, which in turn attracted consumers who sought Android

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179. *See, e.g.*, Alan Santillan, *Mobile Software: Why It's Only Android vs. iOS in 2020*, LEARN HUB (July 30, 2018), learn.g2.com/android-vs-ios ("Barriers to entry in the mobile space are extremely high, and the switching costs that Android and iOS deploy toward their users make it even harder for buyers to switch platforms."); European Commission, *Antitrust: Commission sends Statement of Objections to Google on Android operating system and applications – Factsheet* (Apr. 20, 2016), ec.europa.eu/commission/presscorner/detail/en/MEMO_16_1484 ("There are a number of barriers to entry that protect Google's position, including so-called network effects (that is, the more consumers adopt an operating system, the more developers write Apps for that system).").

180. *See, e.g.* Michael Katz & William Rogerson, *The Applications Barrier to Entry and Its Implication for the Microsoft Remedies: Comment on Iansiti and Richards*, 75(3) ANTITRUST LAW REVIEW 723 (2009) (explaining that a new OS will be desirable to consumers only if a broad array of software applications can run on it, but software developers will find it profitable to create applications that run on an operating system only if there is a large existing base of users).

181. *Majority Staff Report* at 104.

182. *Id.* (citing Richard Trenholm, *Elegant Ubuntu Touch OS Impresses for Phones and Tablets (Hands-On)*, CNET (Feb. 28, 2013), cnet.com/reviews/ubuntu-touch-preview/; Adrian Covert, *The Ubuntu Smartphone (Which No One Will Use) Is a Glimpse of the Future*, CNN BUS (January 2, 2013), money.cnn.com/2013/01/02/technology/mobile/ubuntu-smartphone-linux/ ("Carving out a niche in the seemingly unshakable mobile space -- ruled by the Android-and-Apple duopoly -- still requires a critical mass of users and a lively ecosystem of App developers.")).

183. *Id.* (citing MORNINGSTAR EQUITY ANALYST REPORT, APPLE INC 3 (Aug. 6, 2020)).

184. *Id.* ("The mobile OS market is also characterized by strong network effects. In short, a new mobile OS must have a sufficiently large user base to attract App developers to build Apps to run on the OS. An OS with an insufficient number of users and developers is unlikely to receive support from mobile device manufacturers that will install the OS on their devices, or mobile network operators that will support those devices on their networks.").

phones.[185] Google Android's monopoly in the licensed mobile device operating systems market benefits from "indirect network effects"—in this case meaning that the more developers who write apps compatible with an operating system, the more OEMs and consumers demand the operating system. This cycle of indirect network effects constitutes another barrier to potential suppliers of competing licensed mobile device operating systems.[186]

b. High Profit Margins

83. The ability to sustain high profit margins over extended time periods implies an ability to raise prices over competitive levels.[187] Record evidence indicates that Android generates substantial profits for Google. As early as 2010, a Google presentation noted that [redacted]"[188] Android's contribution to Google's profit margins is estimated in [redacted].

84. In the example below, Google performed a calculation in which [redacted].[194]

185. *See, e.g.,* GOOG-PLAY4-000336290.

186. *See, e.g.,* GOOG-PLAY-004559725.R at -759.R ([redacted]) *See also* GOOG-PLAY-004508011 at -012 [redacted]

187. *See, e.g.,* Landes & Posner, *supra* at 938 ("The standard method of proving market power in antitrust cases involves first defining a relevant market in which to compute the defendant's market share, next computing that share, and then deciding whether it is large enough to support an inference of the required degree of market power. Other evidence - for example, of the defendant's profits, or of the ability of new firms to enter the market, or of price discrimination - may be presented to reinforce or refute the inference from market shares."). *See also* Simcha Barkai, *Declining Labor and Capital Shares* 75(5) JOURNAL OF FINANCE 2421, 2422 (2020) ("Firms that charge consumers high prices relative to the cost of production have high pure profits…an increase in the pure profit share, equal to the ratio of pure profits to gross value added, is indicative of an increase in market power and a decline in competition.")

188. GOOG-PLAY-001337211 at -225 ([redacted]).

189. *See, e.g.,* GOOG-PLAY-011607543; GOOG-PLAY-005577045.

190. GOOG-PLAY-004503351.R at -352.R.

191. GOOG-PLAY-004503351.R at -358.R.

192. GOOG-PLAY-004503351.R at -362.R.

193. GOOG-PLAY-004503351.R at -363.R (referencing [redacted]).

194. GOOG-PLAY-004503351.R at -362.R.

FIGURE 6: GOOGLE LTV ANALYSIS

Source: GOOG-PLAY-004503351.R at -358.R

85. Similarly, in March 2017, Google's LTV calculations indicated that it earned an incremental [redacted].[195]

II. GOOGLE'S MONOPOLY POWER IN THE ANDROID APP DISTRIBUTION MARKET

86. In this section, I demonstrate that the Android App Distribution Market, defined as the market for the sale and distribution of Apps for Android mobile devices, is a distinct relevant antitrust market. I also demonstrate that Google has monopoly power in this market.

A. The Android App Distribution Market Is a Distinct Relevant Antitrust Market

87. The purchaser of a Google Android device always receives the device with the Play Store pre-installed and its icon prominently displayed. Through the Play Store, consumers can access a broad array of Apps offered by myriad developers. Thus, the Play Store is a two-sided matchmaking platform where Google brings together developers wishing to distribute Apps and

195. GOOG-PLAY-011607543 ('OUTPUT' tab; Cell E:9).

consumers wishing to obtain Apps to use on their Google Android devices.[196] The initial download of an App may be considered the consummation of the matchmaking service, giving rise to an offer (by the developer) and acceptance (by the user). Once an App is downloaded onto the Google Android mobile device, however, the Play Store's matchmaking role for the initial download is at an end—and its contribution to value creation diminishes—because the developer has found the consumer and created its own independent channel of distribution with that consumer by virtue of the installation of the developer's App on the consumer's device. Through its App, the developer now has a direct pipeline to the consumer for both communication and purchases of In-App Content. As discussed more fully below, the Android App Distribution Market and In-App Aftermarket are economically distinct.

88. A two-sided platform matches buyers (in this case consumers) and sellers (in this case App developers). Two-sided platforms benefit from "indirect network effects," meaning that each additional buyer makes the platform more appealing to sellers and vice versa.[197] Buyers wish to transact on the platform with the greatest variety of content to choose from, and sellers wish to reach the largest buyer base possible. In the context of the Android App Distribution Market, Google connects consumers of Apps with developers through the Play Store. The presence of more consumers makes the Play Store more appealing to developers, and the presence of more developers make the Play Store more appealing to consumers. A two-sided platform creates value by harnessing these indirect network effects to increase the number of participants on each side of the platform.

89. By Google's estimate, there were over three billion Android devices in the world as of May 2021.[198] To access this customer base of Android users, developers design Apps for Android devices. To list their Apps, developers pay the Play Store a small up-front fee of $25 and Google keeps a percentage (typically 30 percent) of developers' revenues for paid downloads.[199] Developers traditionally reach users through App stores installed on the users' device, but also can distribute their Apps to consumer devices directly from developer websites through a process known as "sideloading."[200]

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196. There is evidence that this matchmaking function is less relevant for some Apps than others. GOOG-PLAY-004626298 ([redacted]).

197. *See, e.g.,* David Evans, *Two-Sided Market Definition* in MARKET DEFINITION IN ANTITRUST: THEORY AND CASE STUDIES (ABA Section of Antitrust Law) 1-35, 5 (2009), papers.ssrn.com/sol3/papers.cfm?abstract_id=1396751 ("A key feature of two-sided platforms is the presence of 'indirect network effects.'").

198. Alex Cranz, *There are over 3 billion active Android devices. That's a lot of smartphones*, THE VERGE (May 18, 2021), theverge.com/2021/5/18/22440813/android-devices-active-number-smartphones-google-2021. The author notes this estimate is conservative because the data are "taken from the Google Play Store, which doesn't take into account devices based on Android but that use alternative stores, including Amazon Fire devices…" *Id.*

199. Play Console Help, *How to use Play Console*, support.google.com/googleplay/android-developer/answer/6112435?hl=en#zippy=%2Cstep-pay-registration-fee ("[T]here is a US$25 one-time registration fee[.]").

200. I exclude sideloading from the Android App Distribution Market, although whether or not it is included does not change my conclusion that Google has monopoly power in the Android App Distribution Market. Sideloading is partially an artifact of Google's restraints, as some developers such as Epic pulled their App outside of the Play

90. While the Play Store is pre-installed on every Google Android mobile device, sideloading requires independent consumer knowledge of the developer's website and the circumvention of onerous technical barriers imposed by Google. *See* Part IV.A.4, *infra.* As a practical consequence, the effective Android App Distribution Market consists almost entirely of Android App stores that have been pre-installed on the mobile device. Record evidence indicates that Apps downloaded outside of Play came to [redacted] Google Android installations globally, and [redacted] Google Android installations in the U.S.[201]

91. Although App stores, like some other two-sided platforms, benefit from indirect network effects, the market for initial App downloads need not always tend toward monopoly.[202] Without the multiple restrictions that Google has imposed, consumers would have easier access to multiple cross-platform App stores.[203]

1. One-Sided and Two-Sided SSNIP Tests Demonstrate The Android App Distribution Market Is a Relevant Antitrust Market

92. As detailed below, the Android App Distribution Market is a distinct relevant antitrust market under the *Horizontal Merger Guidelines*' SSNIP test. When conducting a SSNIP test, it is important to avoid the cellophane fallacy. In *U.S. v. E.I. Dupont de Nemours*, the Supreme Court failed to infer DuPont's dominant market position in cellophane by erroneously defining the relevant market too broadly. Although DuPont produced 75 percent of the cellophane sold in the United States, the Court found that DuPont lacked market power because cellophane accounted for only about 18 percent of a broader market that included other flexible wrapping materials. Because DuPont had already increased cellophane prices substantially above competitive levels, customers had begun to substitute to non-cellophane products that would not have been considered

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Store to evade Google's excessive take rates, leaving users with no choice but to sideload to access the App. *See* Nick Statt, *Apple Just Kicked Fortnite Off the App Store*, THE VERGE (Aug. 13, 2020), theverge.com/2020/8/13/21366438/apple-fortnite-ios-app-store-violations-epic-payments ("Epic previously bypassed Google's Play Store on Android by releasing Fortnite as a direct download through its own software launcher. But the studio eventually relented earlier this year after failing to appeal Google for an exemption of its similar 30 percent cut of all in-App purchases."). Given the hassles imposed on the user, many of which are imposed by Google (see Part IV.A.4, *infra*), sideloading is presently an inferior substitute to downloading an App from an App store. In addition, for many developers, App stores provide access to a large customer base and increased discovery services, while relying on users to sideload would require substantial the users to learn about the application in the first place. For this reason, the ability of users to sideload (albeit with some friction) does not serve as a substitute for an App store, and sideloading does not discipline Google's use of its power in the App distribution market. Finally, even if one were to assume sideloading could be a viable distribution channel for competing App stores, such as the Amazon Appstore, Google has encumbered this channel with "unknown sources" warnings that dissuade consumers from using it. *See* Part IV.A.4.

201. GOOG-PLAY-004489655.R at -656.R [redacted] *See also Id.* at -662.R. Sideloading accounts for approximately [redacted] of all Google Android app installations outside of the Play Store. *Id.* at -656.R.

202. *See, e.g.*, Mark Looi, *On "The Platform Delusion" by Jonathan Knee*, MEDIUM (Dec. 20, 2021), marklooi.medium.com/on-the-platform-delusion-by-jonathan-knee-a787a672b932.

203. Google has produced data calculating the "% sideloaded app" at [redacted] in 2019 and 2020. GOOG-PLAY-001508603 [redacted]). This does not represent the share of Apps sideloaded by users to avoid the Play Store. The [redacted] statistic is driven by [redacted] *Id.* According to these data, [redacted] *Id.*

substitutes at the competitive cellophane price.[204] As detailed below, all of my SNNIP tests avoid the cellophane fallacy by imposing the SSNIP at the estimated competitive take rate rather than the supracompetitive 30 percent take rate that has Google imposed in the Play Store.

93. As detailed below, the SSNIP test confirms that the Android App Distribution Market is a distinct relevant product market regardless of whether I apply (1) a traditional SSNIP test to each side of the market separately; or (2) a two-sided SSNIP to both sides of the market simultaneously. To begin, I analyze the developers' side of the market:

- In a more competitive but-for world, the headline take rate[205] in the Android App Distribution market would be approximately 22.2 percent. (*See* Table 6, *infra*).

- A hypothetical five percent increase above competitive levels would increase the take rate to approximately 23.3 percent (equal to 0.222 x [1.05]), which is far below Google's 30 percent headline take rate.

- Therefore, Google could (and did) profitably maintain the take rate in the Android App Distribution Market far above competitive levels for the duration of the Class Period.

- Consequently, a (not-so) hypothetical monopolist could profitably impose a SSNIP on the price charged to developers in the Android App Distribution Market.

94. If a hypothetical App-store monopolist that distributed Android Apps were to raise its take rate above competitive levels by a small but significant amount, say by five percent in accordance with the *Guidelines*, developers on the monopoly App store would not stop distributing their Apps through that App store, because the Android App Distribution Market is too large to forgo. Android devices account for 40 percent of the mobile devices purchased in the United States, and 71.5 percent of mobile devices bought globally.[206] Developers cannot earn a profit until the margins on their initial downloads or In-App Content cover the often substantial development and marketing costs.[207] As long as incremental sales of Apps are bringing value to developers and paying down their fixed costs, they would not abandon distribution through the Android platform

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204. *United States v. E. I. du Pont de Nemours & Co.*, 351 U.S. 377 (1956). *See also* Luke Froeb & Gregory Werden, *The Reverse Cellophane Fallacy in Market Delineation*, 7 REVIEW OF INDUSTRIAL ORGANIZATION 241-247, 241 (1992) ("In the landmark Cellophane case, the Supreme Court erroneously concluded that du Pont did not have significant market power because the Court evaluated the elasticity of demand for Cellophane at the monopoly equilibrium, at which the elasticity was far higher than at the competitive equilibrium."); *see also* Landes & Posner at 960-961.

205. For most of the Class Period, the vast majority of developers paid a headline take rate of 30 percent; a small percentage of developers participated in special programs offering a fixed percentage-point discount from the headline take rate. Singer Class Cert Reply ¶¶8-9.

206. Statcounter, *Mobile Operating System Market Share Worldwide*, (accessed Sep. 2022), gs.statcounter.com/os-market-share/mobile/worldwide/#yearly-2019-2019-bar. Android and iOS collectively account for 99.71 percent share, while Windows accounts for 0.02 percent of the mobile operating system market worldwide. Statcounter, *Mobile Operating System Market Share United States of America,* (accessed Sep. 2022), gs.statcounter.com/os-market-share/mobile/united-states-of-america.

207. Saylor Academy, *7.1Development Options and Costs*, Business Information Systems: Design an App for That, Table 7.1 "Various Fixed Costs", saylordotorg.github.io/text_business-information-systems-design-an-app-for-that/s11-01-development-options-and-costs html.

in the event of a small but significant price increase over competitive levels. Further, sideloading is not a commercially viable alternative for most developers and therefore does not constrain Google's pricing.[208]

95. Within the Android App Distribution Market, the Play Store has power in large part because of its broad reach. Record evidence suggests that developers are attracted to the Play Store primarily because of its reach.[209] In 2015, Google asked Dr. Itamar Simonson to [redacted][210] The survey's objectives included [redacted][211] Dr. Simonson concluded that the [redacted]"[212] In short, developers of Android-compatible Apps would be insensitive to a small, but significant, sustained increase in Android App distribution take rates, and hence the Android Application Distribution Market is a distinct relevant antitrust market.

96. Turning to the consumer side, my Discount Model[213] demonstrates that a hypothetical monopolist could profitably decrease the consumer subsidy below competitive levels—that is, charge consumers a higher price for access than competitive levels.

- In a more competitive but-for world, the consumer subsidy would increase from [redacted] to [redacted] (*See* Table 16, *infra*).
- A hypothetical five percent decrease in the consumer subsidy below competitive levels would decrease the subsidy to approximately [redacted] (equal to [redacted]), which is far above Google's actual subsidy of [redacted].
- Therefore, Google could (and did) profitably maintain the consumer subsidy far below competitive levels for the duration of the Class Period.

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208. *See, e.g.,* Koh Dep. 50:14-51:5 ([redacted]); *Id.* at 101:21-102:14 ([redacted]).

209. *Id.* at 89:25-90:9 ([redacted]); *Id.* at 321:19-323:1 ([redacted] *Id.* at 324:6-12 ([redacted]).

210. GOOG-PLAY-007317611 at -613 ([redacted]). [redacted]. *Id.* at -618. [redacted]. *Id.* at -619.

211. *Id.* at -613.

212. *Id.* at -615.

213. As explained in Part VI.E below, in a more competitive but-for world, Google could increase the discounts offered to consumers to encourage their use of the Play Store, consistent with what is observed in other two-sided markets such as payment cards. My Discount Model analyzes this effect. In addition, my Amazon Discount Model in Part VII.C below estimates aggregate damages based on the Amazon Appstore's generous consumer discounts on Google Android devices.

- Consequently, a (not-so) hypothetical monopolist could profitably impose a SSNIP on the (negative) price charged to consumers.

97. A hypothetical monopolist in the Android App Distribution Market would be able to profitably increase consumer prices above competitive levels. Even if consumers had perfect information about take rates and the restrictions on developers as well as their implications for App prices over the lifecycle of the device (which they do not have in the actual world), very few would switch their device and operating system in response to a small, but significant, difference in the take rate charged to developers by a monopolist App store. That is especially true for Android phone users due to the significantly higher prices of Apple iPhones, which are two to three times as expensive on average as Android phones.[214] A price difference this large would require extraordinary spending by consumers on Android Apps for a five percent increase in the App store take rate to render a switch economically plausible.[215] Further, the vast majority of Android users (nearly 80 percent) keep their Android phones for over a year, and many (nearly 30 percent) keep their phones for over two years.[216] As a result of the factors contributing to lock-in explained in Part I.A.1.b, consumers display a high degree of loyalty to the operating system they have chosen and learned, and they would not switch devices due to a small, but significant, increase in the take rate or associated App price for Android App distribution.[217]

98. Finally, I apply a two-sided SSNIP to both sides of the market simultaneously by assessing the profitability of a hypothetical increase in total price paid by both sides of the market:

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214. Amit Chowdhry, *Average iPhone Price Increases To $687 and Android Decreases To $254, Says Report*, FORBES (Feb. 3, 2015), forbes.com/sites/amitchowdhry/2015/02/03/average-iphone-price-increases-to-687-and-android-decreases-to-254-says-report/?sh=d9bcd17539e4.

215. A 2021 survey found that only 5.2 percent of users chose "better prices" as a reason why Android users would consider switching to an iPhone. This implies that the switch would be unlikely and uneconomic for most, regardless of whether "better prices" meant better prices for the device or for the Apps. Among the other reasons were "[l]onger software support," "Apple ecosystem integration," and "[b]etter privacy protection." *See* Abhin Mahipal, *Survey: 18% of Android users would consider switching to iPhone 13, but this is down 15% from last year*, SELLCELL (Aug. 31, 2021), sellcell.com/blog/survey-18-percent-of-android-users-would-consider-switching-to-iphone-13/.

216. Consumer Intelligence Research Partners, *How Long Do Android Users Own an Android Phone* (Sep. 21, 2016), files.constantcontact.com/150f9af2201/a238f4a1-5b70-4853-b21e-226c94104d30.pdf. It bears noting that these data are from 2016, and the trend across all devices is to keep phones for even longer periods. *See* Abigail Ng, *Smartphone users are waiting longer before upgrading — here's why*, CNBC (May 17, 2019), cnbc.com/2019/05/17/smartphone-users-are-waiting-longer-before-upgrading-heres-why.html. ("In 2016, American smartphone owners used their phones for 22.7 months on average before upgrading. By 2018, that number had increased to 24.7."). *See also* GOOG-PLAY-007745710 at -740—741, a May 2021 slide deck titled [redacted].

217. *See, e.g.,* Chuck Jones, *Apple's iOS Loyalty Rate Is Lower Than Google's Android, But Apple May Steal More Users Each Year*, FORBES (Mar. 10, 2018), forbes.com/sites/chuckjones/2018/03/10/apples-ios-loyalty-rate-is-lower-than-googles-android-but-apple-may-steal-more-users-each-year/?sh=29b39ae68a8e ("Loyalty is also as high as we've ever seen, really from 85-90% at any given point. With only two mobile operating systems at this point, it appears *users now pick one, learn it, invest in Apps and storage, and stick with it*.") (emphasis added). *See also* Consumer Intelligence Research Partners, *Mobile Operating System Loyalty: High and Steady* (Mar. 8, 2018), files.constantcontact.com/150f9af2201/4bca9a19-a8b0-46bd-95bd-85740ff3fb5d.pdf ("CIRP finds that between Android and iOS, loyalty to each has remained steady since early 2016, at the highest levels seen. Android has a 91% loyalty rate, compared to 86% for iOS, measured as the percentage of customers that remain with each operating system when activating a new phone over the twelve months ending December 2017.").

- The Android App Distribution is a two-sided transaction market.

- In a two-sided transaction market, a SSNIP can be implemented by determining whether a hypothetical monopolist could profitably increase the *sum* of the prices paid for the transaction by both parties above competitive levels.

- In a competitive but-for world, the total transaction price in the Android App Distribution Market would be approximately [redacted] (*See* Table 6; equal to the competitive App price of [redacted], multiplied by the competitive take rate of [redacted]).

- In the actual world, Google's total transaction price in the Android App Distribution Market was approximately [redacted] (*See* Table 6; equal to the actual App price of [redacted], multiplied by the actual take rate of [redacted]).[218]

- Put differently, Google's actual total transaction price in the Android App Distribution Market is approximately [redacted] percent above the competitive price (equal to [redacted]).

- Google could (and did) profitably maintain the total transaction price far above competitive levels for the duration of the Class Period.

- Consequently, a (not-so) hypothetical monopolist could profitably impose a SSNIP on the total transaction price in the Android App Distribution Market.

99. In sum, analyzing whether there is an Android App Distribution Market from both the developer and consumer perspectives or both sides simultaneously leads to the conclusion that it is a distinct relevant antitrust market. Any competition that might exist between Google and Apple with respect to the device or ecosystem does not significantly constrain Google's ability to extract supra-competitive prices in the Android App Distribution Market. That Apple[219] (in November 2020) and Google[220] (in March 2021) lowered take rates for small developers to 15 percent within a few months of each other does not imply one take-rate reduction was caused by the other, nor does it imply that their two App stores significantly discipline each other's prices (for developers) and thus are in the same product market. The moves came just after antitrust lawsuits were filed in August 2020, and Congress published a report on the platforms' conduct in

218. More precisely, Google's total transaction price in the Android App Distribution market was approximately [redacted].

219. Kif Leswing, *Apple will cut App Store commissions by half to 15% for small App makers*, CNBC (Nov. 18, 2020), cnbc.com/2020/11/18/apple-will-cut-app-store-fees-by-half-to-15percent-for-small-developers html (describing the take-rate decrease as a "high-profile olive branch from Apple to lawmakers.").

220. Chaim Gartenberg, *Google will reduce Play Store cut to 15 percent for a developer's first $1M in annual revenue*, THE VERGE (Mar. 16, 2021), theverge.com/2021/3/16/22333777/google-play-store-fee-reduction-developers-1-million-dollars.

October 2020.[221] Internal Google documents also suggest that the decision to reduce its take rate on small developers was driven at least in part by public-relations and regulatory considerations.[222]

100. I understand that Professor Presser will present survey evidence indicating that only a very small proportion of U.S. Android phone users would switch to an Apple phone in response to a five percent increase in the price of Apps and In-App Content.[223]

2. Devices Such as PCs and Gaming Consoles Do Not Expand The Relevant Market

101. Devices such as PCs and gaming consoles do not expand the Android App Distribution Market, for the same reasons that they do not expand the market for mobile OSs, as explained in Part I.A.4 above.

102. In addition, as described in more detail in Part VI.B.5, the Epic Games Store[224] and Microsoft[225] have both charged developers a twelve percent take rate on their respective PC game platforms. That this large disparity in take rates persists implies that developers perceive the Play Store to be a unique outlet, and developers are beholden to Google to reach their critical audience of consumers. And Google has not changed its pricing in response to changes in take rates from Microsoft, console makers, or the Epic Store.

3. Streaming Apps and Web Apps Do Not Expand the Relevant Market

103. In addition to native apps, Android users may also access mobile games through web-based apps or game-streaming platforms. Web-based apps are apps that reside on the Internet outside of an App store. Users access these apps directly in a mobile device browser. Game-streaming platforms provide users access to a library of games by streaming the games from a remote cloud server to the user's device.[226] Game-streaming platforms may be accessed from PCs,

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221. *Id*. ("The new policy also comes at a critical moment when Google (and Apple's) App store policies are under intense public scrutiny, kicked off by the removal of Epic Games' *Fortnite* from both the App Store and Play Store and the game developer's subsequent antitrust lawsuits against Apple and Google.").

222. Google's documents suggest that its decision in March 2021, to reduce its take rate to 15 percent for the first $1 million in developer revenue was driven at least in part by public-relations considerations. *See* GOOG-PLAY-007317535 [redacted]; GOOG-PLAY-007317528 ([redacted]).

223. Presser Report at 7-9.

224. Epic Press Release, *The Epic Games store is now live*, (Dec. 6, 2018), epicgames.com/store/en-US/news/the-epic-games-store-is-now-live ("The Epic Games store is now open, featuring awesome high-quality games from other developers. Our goal is to bring you great games, and to give game developers a better deal: they receive 88% of the money you spend, versus only 70% elsewhere. This helps developers succeed and make more of the games you love.").

225. Tom Warren, *Microsoft shakes up PC gaming by reducing Windows store cut to just 12 percent*, THE VERGE (Apr. 29, 2021), theverge.com/2021/4/29/22409285/microsoft-store-cut-windows-pc-games-12-percent.

226. Jacob Roach and Kevin Parrish, *What is cloud gaming?*, DIGITAL TRENDS (Mar. 29, 2021), digitaltrends.com/gaming/what-is-cloud-gaming-explained/.

consoles, or mobile devices.[227] When accessed via mobile devices, game-streaming platforms may run through a native App or through a mobile browser.[228]

104. These "Web-based apps" do not expand the relevant market. According to Google's documents, [redacted].[229] Traditional Apps are typically installed on the home screen and provide users with what Google considers [redacted][230] Some traditional Apps can support "offline mode" or can be used without an Internet connection.[231] In most cases, after a traditional App is launched, the user is returned to the place where she left,[232] another significant benefit. "Web apps," by contrast, began simply as bookmarked links to the web version of an app, opened in a browser.[233] Unlike traditional—or "native"—Apps, these web apps require an internet connection,[234] perform slower than native Apps,[235] cannot access useful native functions (e.g., the phone's camera),[236] and do not show up in the Android App launcher.[237] According to Google, [redacted][238] As the House Judiciary Committee's Investigation of Competition in Digital Markets concluded, "Websites and web apps are not competitively significant alternatives to the dominant [A]pp stores on iOS and Android devices for distributing software to mobile devices. Apps provide a deeper, richer user experience and can provide additional functionality by accessing features within the mobile device's hardware and operating system, such as camera or location services."[239] Web-based apps are no substitute for apps on the Play Store in the Android App Distribution Market.

105. Game-streaming platforms also do not constrain Google's pricing on the Play Store. As an initial matter, game-streaming platforms are focused on gaming, so they do not provide a substitute for the wide range of the applications available in the Play Store, including most or all non-gaming Apps. Moreover, game-streaming is in its infancy. The user base remains small – one 2020 Google presentation estimated the [redacted][240] In 2019, it represented [redacted] of mobile games revenue.[241] For most of the Play Store's history, game-streaming has not been a meaningful market alternative.

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227. *Id.*
228. *Id.*
229. GOOG-PLAY-001882239.
230. *Id.* at -256.R.
231. *Id.*
232. *Id.* at -257.R.
233. *Id.* at -261.R.
234. *Id.* at -264.R.
235. *Id.*
236. *Id.* at -265.R.
237. *Id.* at -263.R.
238. *Id.* at -274.R.
239. *Investigation of Competition in Digital Markets, Final Report and Recommendations,* H.R. Subcommittee on Antitrust, Commercial and Administrative Law of the Committee on the Judiciary (2021) at 96, https://docs.house.gov/meetings/JU/JU00/20210414/111451/HMKP-117-JU00-20210414-SD001.pdf.
240. GOOG-PLAY-004693144.R at -190.R.
241. *Id.*

106. Record evidence indicates that technology has not advanced to a point where game-streaming on mobile devices offers an economic substitute to mobile gaming. Unlike native Apps, mobile game-streaming requires that a user maintain a high-quality internet connection throughout the gameplay experience. For instance, Amazon's game-streaming service, Amazon Luna, recommends that users stream games via a wired connection—and, if accessing the service via a wireless device, use a 5G data connection.[242] While Donn Morrill, Director of Developer Relations at Amazon, testified that [redacted][243] Since Epic launched Fortnite on Nvidia's GeForce Now and Microsoft's Xbox Cloud service, both leading game-streaming platforms,[244] Epic VP of Business Joe Kreiner found that [redacted]".[245] [redacted].[246]

107. Moreover, even with high quality Internet connections, streaming introduces "latency" in the gameplay experience that limits the ability for these services to substitute native App gameplay. Mr. Morrill testified that [redacted][247] One commentator from CNET wrote in 2021, "The first few steps in many cloud games feel great… and… then… the… lag… sets… in. . . . Or you're not experiencing any game-breaking lag, but the service indicates you've got network issues, which pulls you out of the experience."[248] This commentator concluded, "Despite leaps in technology and big names like Google, Nvidia and Amazon, streaming games like you do Netflix movies is still a rough experience."[249]

108. Game-streaming platforms themselves recognize that their services do not provide a substitute for mobile gaming. One game-streaming app, [redacted], explained in communications with Apple, [redacted][250]

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242. Morrill Dep. 459:23-460:20 ([redacted]).

243. *Id.* at 447:12-22.

244. *See* Nick Fernandez, *Google Stadia vs GeForce Now: Which game-streaming service is right for you?*, ANDROID AUTHORITY (Jan. 21, 2022), androidauthority.com/google-stadia-vs-geforce-now-1080793/; Nick Fernandez, *Xbox Cloud Gaming: Everything you need to know about the service*, ANDROID AUTHORITY (June 22, 2022), androidauthority.com/xbox-cloud-gaming-1205717/.

245. Kreiner Dep. 404:15-406:25.

246. *Id.* ([redacted]).

247. Morrill Dep. 449:10-15 [redacted]).

248. Dan Ackerman, *5 reasons cloud gaming isn't doing it for me -- yet*, CNET (Feb. 19, 2021), cnet.com/tech/computing/5-reasons-cloud-gaming-isnt-doing-it-for-me-yet/.

249. *Id.*

250. APL-Goog_00394970 at -970—971.

In theory, game-streaming platforms might one day comprise a significant segment of the mobile gaming market, but they are not currently a substitute for mobile gaming in native Apps.

B. The Relevant Geographic Android App Distribution Market Is Global (Excluding China)

109. A (not so) hypothetical monopolist over the Android App Distribution Market worldwide (excluding China) could profitability exercise market power over developers and consumers. As explained in Part I.A.1.b and Part I.A.1.c, and exercise of market power could not be defeated by switching to Apple devices. Nor could the exercise of market power be defeated by switching to alternatives such as PCs and gaming consoles, as explained in Part I.A.4 above. Nor could it be defeated by limiting operations to China: Developers distributing only in China would not be able to reach consumers in the rest of the world; the hypothetical monopolist could identify a user's geographic location, and thus could withhold distribution services to customers outside China.

110. It is possible that a hypothetical monopolist in the Android App Distribution Market in the United States alone could profitably exercise market power. For purposes of my analysis here, it is not necessary to limit the geographic market to the United States, given the global reach of Google's monopoly power and the Challenged Conduct.

C. Google's Market Power in the Android App Distribution Market

111. This section begins by describing evidence that directly demonstrates Google's market power in the Android App Distribution Market. I also use indirect evidence—high market shares and entry barriers—to establish that Google has market power.

1. Direct Evidence: Ability to Exclude Rivals

112. A classic hallmark of market power is the ability to exclude or impair rivals.[251] Record evidence indicates that Google has done exactly that in the Android App Distribution Market. As detailed below, Google has used anticompetitive means to impair competitors, including economic incentives and technical barriers to exclude or impair potential competitors—including Amazon, Facebook, Epic, and other prominent App developers—from effectively deploying competing App stores.

113. The Amazon Appstore was launched in 2011. A Google "Market Strategy" presentation prepared that year proposed that [redacted].[252]

251. *United States v. E. I. du Pont de Nemours & Co.* ("*Cellophane*"), 351 U.S. 377, 391 (1956) (A firm has market power if it possesses "the power to control prices or exclude competition."). *See also* Baker & Bresnahan at 15. *See also* Thomas Krattenmaker, Robert Lande & Steven Salop, *Monopoly Power and Market Power in Antitrust Law*, 76 GEORGETOWN L.J. 241 (1987).

252. GOOG-PLAY-004223307 at -322.

[redacted]"[253] [redacted].[254] In 2015, Amazon released a version of Amazon Shopping App on Google Play that also included the Amazon Appstore.[255] According to press coverage at the time, "The move effectively turns Amazon's flagship application—an App that has somewhere between 50 million and 100 million installs, according to Google Play's data for the smartphone version—into an App store App that directly competes with Google Play, while also being sold on Google Play."[256] [redacted].[257]

114. Beginning in 2015, [redacted].[261] Amazon executive Don Morrill testified that [redacted]

253. Morrill (Amazon 30(b)(6) designee) Dep. 193:4-194:17 [redacted]; AMZ-GP_00001721 at -722 [redacted].

254. Morrill Dep. 194:18-22 [redacted]

255. Morrill Dep. 180:20-181:4 ([redacted]

256. GOOG-PLAY-000832219 at -221

257. Google's [redacted] in an email to Sameer Samat on March 14, 2015. GOOG-PLAY-000832219 ("[redacted]). *See also* Morrill Dep. 181:1-15 ("[redacted]).

258. Morrill Dep. 182:8-23 [redacted]).

259. AMZ-GP_00005523.

260. *Id.*

261. *Id.*

[redacted][262] In 2017, Amazon announced it would be shutting down Amazon Underground.[263]

115. As explained in Part VI.B.5.c below, Amazon has offered substantial consumer subsidies such as Amazon Coins. Amazon Coins is a currency that provides a direct consumer subsidy by enabling Amazon Appstore users to purchase apps or in-app content at a discounted price.[264] Programs such as Amazon Coins provided direct consumer subsidies of approximately [redacted] of consumer expenditure in the Amazon Appstore when accessed via Google Android devices. Amazon noted in 2020 that of the [redacted][265] According to a 2021 Amazon study, [redacted].[266] Nevertheless, Amazon [redacted][267] That discounts of this magnitude were insufficient to make the Amazon Appstore a more effective competitor provides further evidence of Google's ability to exclude rivals.

116. As detailed in Part IV.A.3.b below, Google's Project Hug secured content from some of the largest developers, [redacted]. Project Hug impaired entry and expansion by competing App stores, and provides further evidence of Google's ability to exclude rivals.

117. As detailed in Part IV.A.3.c below, I understand that Google may [redacted]. Although I am not opining on the existence of such an agreement, if the fact finder determines that such an agreement was in place, it likely would have generated anticompetitive effects.

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262. Morrill Dep. 185:12-186:9 [redacted]).

263. Sarah Perez, *Amazon is shutting down its 'Underground Actually Free' program that gives away free Android apps*, TECH CRUNCH (April 28, 2017), techcrunch.com/2017/04/28/amazon-is-shutting-down-its-underground-actually-free-program-that-gives-away-free-android-apps/.

264. *Amazon Coins Basics*, Amazon, : https://www.amazon.com/b/ref=s9_acss_bw_cg_masfr_1b1_w?node=21428594011&pf_rd_m=ATVPDKIKX0DER&pf_rd_s=merchandised-search-1&pf_rd_r=1FAV02E1JX4P7C7R35K7&pf_rd_t=101&pf_rd_p=5072b22c-b33c-4c93-898a-6716fe966ef4&pf_rd_i=21435619011 ("You can buy Amazon Coins bundles for a discounted price exclusively from Amazon. Using Coins, you can save on eligible games and in-app items sold by Amazon Appstore. Preload your account with Coins to save time (and money!) when making in-app purchases. 100 Amazon Coins are worth $1.00 in value. You can see the Coins discounts on the Buy Coins web page. The more Coins you buy, the bigger the discount.")

265. AMZ-GP_00002484 at -2488.

266. AMZ-GP_00001672.

267. AMZ-GP_00002484 at -2488.

118. That Google profitably imposed a 30 percent take rate on developers for most paid App downloads is direct evidence of its market power over developers in the Android App Distribution Market. As shown in Part VI.B.5, *infra*, this take rate is high relative to competitive benchmarks. In the presence of competition, developers would be able to offer their Apps on Android devices through multiple App stores; a developer unwilling to pay a 30-percent take rate could choose to market and distribute its App on a competing App store without losing access to most customers.

119. Google considered adjustments to its business model and to its take-rate levels,

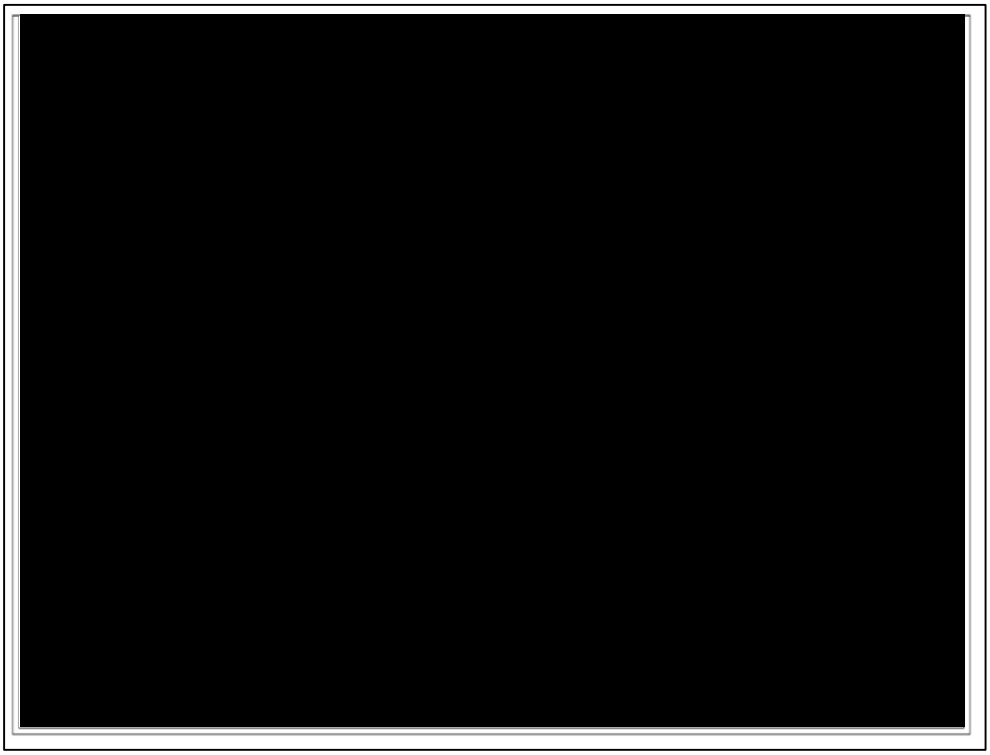
2. Indirect Evidence

a. High Market Share and Entry Barriers

120. Google's power in the Android App Distribution Market can also be gleaned indirectly via its high market shares and entry barriers.[273] As seen below, according to a "Competitive Usage Survey,"[274] the Play Store enjoys market shares of . Google Play's market share is a even in South Korea, where it faced more competition than in other countries. The document lists "[275] [276] "[277]

268. GOOG-PLAY-000443763.R. at -775.R.
269. *Id*. at -774.R.
270. *Id*. at -776.R.
271. *Id*. at -776.R-777.R.
272. *Id*. at -770.R.
273. Entry barriers tend to eliminate the possibility a competitive fringe can readily and substantially increase production in response to a small increase in the incumbent's price. *See, e.g.,* Landes & Posner *supra*, at 947.
274. GOOG-PLAY-001886111.R.
275. GOOG-PLAY-001886111.R at -118.R.
276. AMZ-GP_00002484 at -2488.
277. AMZ-GP_00001672.

FIGURE 7: MARKET SHARES, GOOGLE PLAY COMPETITIVE USAGE SURVEY (CIRCA 2016)



Source: GOOG-PLAY-001886111.R at -118.R ([redacted]).

121. As of October 2021, a total of over 21.6 billion Apps had been downloaded from the Play Store.[278] Excluding China, where the Play Store is blocked,[279] "Apple and Google control more than 95 percent of the app store market share through iOS and Android…The [a]pp economy was built on these two platforms[.]"[280] According to a 2020 Google Board of Directors Update, [redacted][281] Due in part to the massive installed base of mobile Android devices, significantly more apps are downloaded from the Play Store than from the Apple App Store. For example, in 2020, there were approximately 108.5 billion downloads from the Play Store, compared with 34.4 billion through

278. Terry Stancheva, *17 App Revenue Statistics – Mobile Is Changing the Game in 2022*, TECHJURY, (Jun. 3, 2022), techjury.net/blog/app-revenue-statistics/#gref (citing Statista).

279. Sherisse Pham, *Google now has two Apps in China, but search remains off limits*, CNN BUSINESS, (May 31, 2018), money.cnn.com/2018/05/31/technology/google-in-china-files-app/index html ("The company's own App store, Google Play, remains blocked in China[.]").

280. David Curry, *App Store Data (2022),* BUSINESS OF APPS, (Jan. 11, 2022), www.businessofApps.com/data/app-stores/

281. GOOG-PLAY-001018676.R at -689.R.

Apple App Store.[282] Excluding China, the Play Store accounted for over 80 percent of the combined global downloads from the Play Store and the Apple App Store in 2020.[283]

122. Data from industry analysts on mobile app expenditures (which aggregates consumer expenditures on both initial downloads and in-app purchases) confirm (1) that the Play Store and the Apple App Store account for the vast majority of mobile app expenditures outside China; and (2) that the Play Store alone accounts for the vast majority of mobile app expenditures outside China and distinct from iOS. In light of the global dominance of the Play Store and the Apple App Store, industry reports covering mobile apps often focus almost exclusively on these two platforms.[284] But even when other platforms are considered, the data confirm that the Play Store and the Apple App Store account for the vast majority of mobile app expenditures outside of China. For example, global consumer expenditures in Apple's App Store outside of China in 2018 were $32.9 billion,[285] while global consumer expenditures in the Play Store (all of which is outside of China) came to $25 billion in 2018.[286] Global mobile app expenditures outside of China in 2018 were $62 billion.[287] Therefore, outside of China, the Apple App Store and the Play Store accounted for 93.4 percent of global mobile app expenditures as of 2018 (equal to [$32.9 billion + $25.0 billion]/[$62 billion]). Using the same statistics, the Play Store accounted for 85.9 percent

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282. David Curry, *App Data Report,* BUSINESS OF APPS (2022) at 16-17 (showing 34.4 billion downloads via iOS and 108.5 billion via Google Play).

283. According to Sensor Tower, The Play Store's total global downloads in 2020 (excluding China) were 108.759 billion (6.3 billion + 22.5 billion + 5.7 billion + 2.8 billion + 21.1 billion + 49.9 billion + 459 million = 108.759 billion). *See* Sensor Tower, *2021 – 2025 Mobile Market Forecast* (2021) at 15. The Apple App Store's total global downloads in 2020 were 34.297 billion (8.9 billion + 2.0 billion + 312 million + 1.3 billion + 7.3 billion + 13.9 billion + 585 million = 34.297 billion). *Id* at 14. 8.2 billion of these downloads come from China. *Id* at 31. Therefore, in 2020, the Play Store accounted for over 80.6 percent combined global downloads from the Play Store and the Apple App Store (equal to 108.759 billion / (108.759 billion + 34.297 billion – 8.2 billion)). Note that consumer expenditures in the Apple App Store exceed those in the Play Store, despite the fact that far more Apps are downloaded through the Play Store. *See, e.g.,* David Curry, *App Data Report* at 29 ("Even though Google Play has a larger installed base and 75% of all Apps are downloaded on the platform, Apple's App Store leads the way in revenue."). Download statistics differ from consumer expenditure statistics in at least two important ways. *First*, many Apps are downloaded free of charge. *Second*, industry data on consumer expenditures consolidates consumer expenditures on initial downloads with consumer expenditures on in-App purchases. *See, e.g., Id*. at 30 (showing aggregate "iOS App and Game Revenues" of $72 billion in 2020); *see also* Sensor Tower, *2021 – 2025 Mobile Market Forecast* (2021) at 36 (also showing a total of $72 billion in 2020 for "App Store Spending" on "Apps" and "Games"; explaining that "[d]riven by the significant success of the *in-App subscription model*, App revenue increased 4.7x between 2016 and 2020, compared to an increase of 2x for games.") (emphasis added). Note also that, based on the Play Store's financials, the vast majority of Play Store revenue comes from Apps and In-App purchases, as opposed to TV/Movies. *See, e.g*., GOOG-PLAY-010801682 ([redacted]).

284. *See, e.g.,* Stephanie Chan, *Global Consumer Spending in Mobile Apps Reached $133 Billion in 2021, Up Nearly 20% from 2020,* SENSOR TOWER (Dec. 2021), sensortower.com/blog/app-revenue-and-downloads-2021 (reporting "Global Consumer Spending in Mobile Apps and Games" as the sum of Google Play and the App Store). *See also* David Curry, *App Data Report*; Sensor Tower, *2019 – 2023 Mobile Market Forecast* (2019).

285. In 2018, global consumer expenditures reached $47 billion in the Apple App Store. *See* Sensor Tower, *2019 – 2023 Mobile Market Forecast* (2019) at 4. Consumer expenditures in the Apple App Store in China were $14.1 billion in 2018. *Id.* at 15. Therefore, non-China Apple App Store expenditures in 2018 were $47 billion - $14.1 billion = $32.9 billion.

286. *Id.* at 4. Consumer expenditures on Apple's App Store exceed those in the Play Store despite the Play Store's larger installed base because Apple's customer base skews toward higher-income users who spend more on Apps and In-App Content.

287. *See* David Curry, *App Data Report* at 44 (showing 2018 non-China revenue of $20 billion (United States) + $15 billion (Japan) + $11 billion (Europe) + $16 billion (Rest of World) = $62 billion).

of non-Apple mobile app expenditures outside of China in 2018 (equal to [$25.0 billion]/[$62 billion - $32.9 billion]).

123. In 2020, global consumer expenditures in Apple's App Store outside of China came to $52 billion,[288] while global consumer expenditures in the Play Store (all of which is outside of China) came to $39 billion in 2020.[289] Global mobile app expenditures outside of China in 2020 were $95 billion.[290] Therefore, outside of China, the Apple App Store and the Play Store accounted for 95.8 percent of global mobile app expenditures as of 2020 (equal to [$52 billion + $39 billion]/[$95 billion]). Using the same statistics, the Play Store alone accounted for 90.7 percent of non-Apple mobile app expenditures outside China in 2020 (equal to [$39 billion]/[$95 billion - $52 billion]).

124. Similarly, statistics on downloads (as opposed to consumer expenditure) indicate that the Play Store's share of the non-China Android App Distribution Market can be estimated at over 90 percent.[291] Nearly 60 percent of non-iOS apps downloaded worldwide in 2020 were downloaded through the Play Store,[292] but this estimate vastly understates the Play Store's share of Android downloads, as the denominator includes downloads in China, where the Play Store is blocked. Removing non-iOS downloads in China would likely place the Play Store at over 90 percent of the non-China Android App Distribution Market. For example, if iOS downloads

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288. In 2020, global consumer expenditures reached $72 billion in the Apple App Store. *See* Sensor Tower, *2021 – 2025 Mobile Market Forecast* (2021) at 6. Consumer expenditures in the Apple App Store in China were $20 billion in 2020. *Id.* at 22. Therefore, non-China Apple App Store expenditures in 2020 were $72 billion - $20 billion = $52 billion.

289. *Id.* at 6.

290. *See* David Curry, *App Data Report* at 44 (showing 2020 non-China revenue of $32 billion (United States) + $20 billion (Japan) + $14 billion (Europe) + $29 billion (Rest of World) = $95 billion).

291. As explained above, download statistics differ from consumer expenditure statistics in at least two important ways. *First*, many Apps are downloaded free of charge. *Second*, as explained above, industry data on consumer expenditures aggregates consumer expenditures on initial downloads with consumer expenditures on in-App purchases.

292. According to Statista, the total number of App downloads in 2021 was 230 billion, with the Play Store and iOS accounting for 144.4 billion. Statista, *Number of mobile Apps downloaded worldwide from 2016 to 2021*, statista.com/statistics/271644/worldwide-free-and-paid-mobile-app-store-downloads/; Statista, *Combined global Apple App Store and Google Play Store App downloads from 1st quarter 2015 to 2nd quarter 2022*, statista.com/statistics/604343/number-of-apple-app-store-and-google-play-app-downloads-worldwide/. The Play Store was responsible for 108.5 billion downloads in 2020 and iOS had 34.4 billion, for a total of 142.9 billion. *See* Mansoor Iqbal, *App Download Data (2022),* BUSINESS OF APPS, (Aug. 31, 2022), businessofApps.com/data/app-statistics/ [hereafter *App Download Stats*]. This implies that the Play Store was responsible for 59 percent of the non-iOS downloads worldwide. In 2020, there were 183.6 billion non-iOS downloads (218 billion less 34.4 billion) and 108.5 billion Play Store downloads. Dividing 108.5 by 183.6 yields 0.59.

account for one quarter of all mobile downloads in China,[293] then the Play Store's share of the non-China Android App Distribution Market would be 97 percent.[294]

125. Internal Google documents show that [redacted].[295] According to a 2019 Google slide deck [redacted].[296] As seen below, the Samsung Galaxy Store accounts for just two percent of total monthly OEM App store visits. Other OEM App stores also have trivial market shares in comparison to the Play Store. Even when these statistics are broken out by geographic area, [redacted][297]

293. *See* Statista, *Market share of mobile operating systems in China from January 2013 to December 2021**, statista.com/statistics/262176/market-share-held-by-mobile-operating-systems-in-china/ (In October, November, and December of 2021, iOS accounted for 18.99, 19.28, and 21.08 percent of mobile operating systems in China, respectively. In the last quarter of 2021, Apple accounted for approximately (18.99 + 19.28 + 21.08)/3 = 19.8% of mobile operating systems in China.) I conservatively set the percentage to 25 percent for purposes of my calculations here.

294. There were 96.2 billion downloads in China in 2020. *See App Download Stats*, *supra*. Assuming one quarter of those were iOS, then non-iOS downloads in China would be 72.15 billion (equal to 96.2 billion * (1 – 1/4)). Therefore, total worldwide non-iOS downloads outside China would amount to 183.6 billion – 72.15 billion = 111.45 billion. The Play Store share of the non-China Android App Distribution Market would then equal 108.5 billion / 111.45 billion = 0.97.

295. *See* GOOG-PLAY-002076224.R ([redacted]) *Id.* at -229.R. Google's analysis also shows that the [redacted]. *Id.* at -236.R.

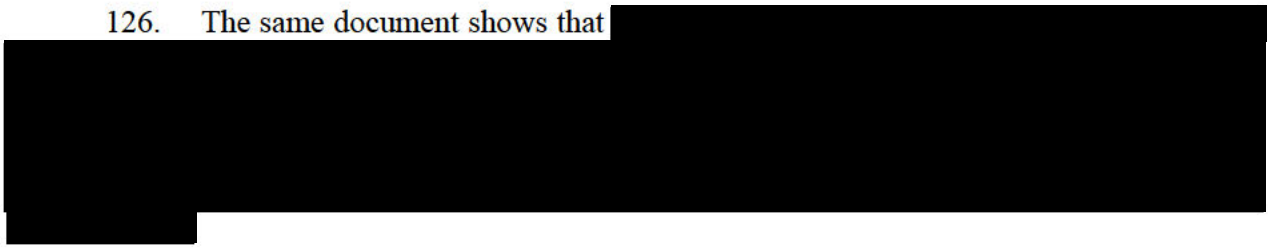
296. *Id.* at -229.R.

297. *Id.* at -229.R.

FIGURE 8:
DISTRIBUTION OF VISITS TO ANDROID OEM APP STORES WORLDWIDE (EXCLUDING CHINA)

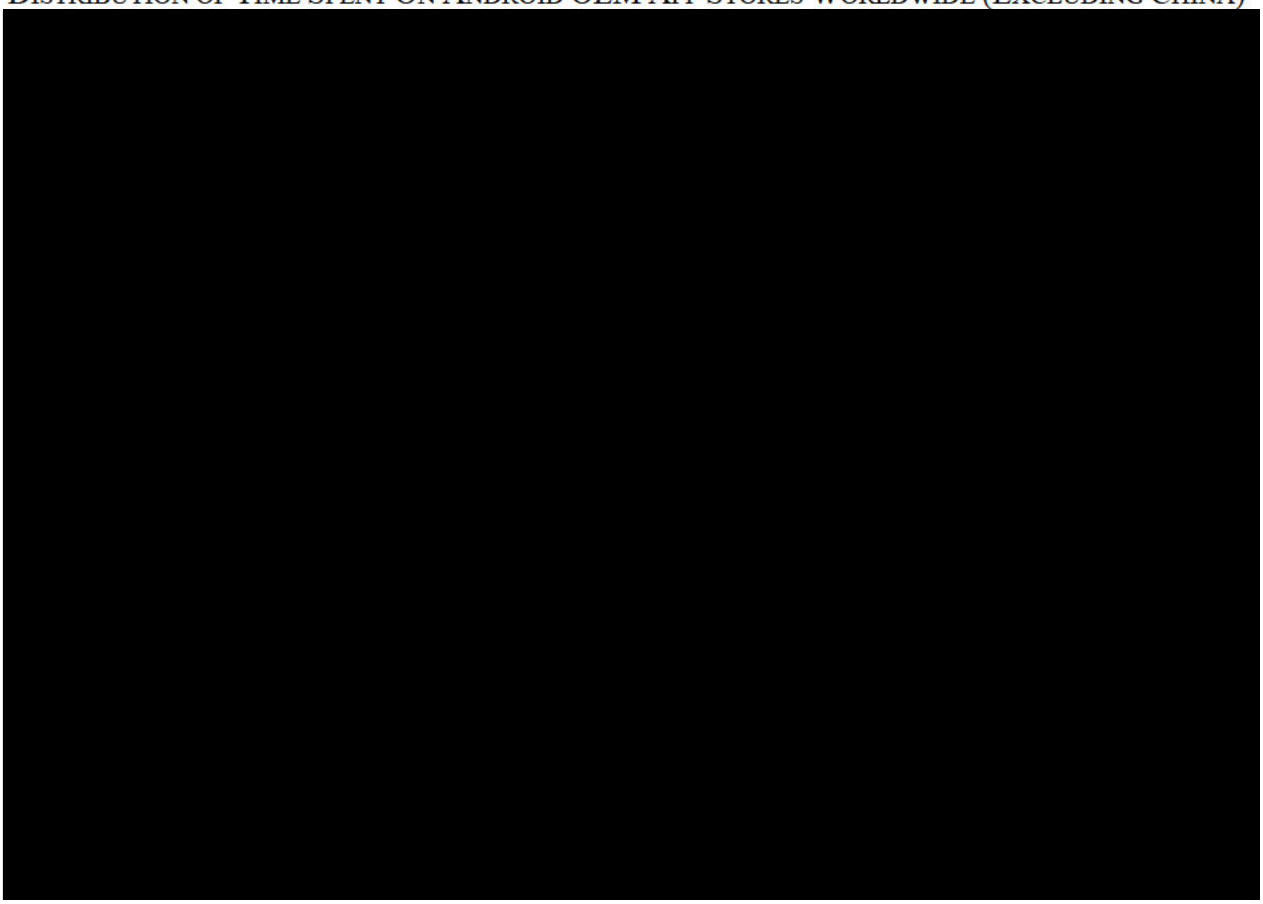
Source: GOOG-PLAY-002076224.R. Data as of October 2019.

126. The same document shows that



298. GOOG-PLAY-002076224.R at -236.R.

FIGURE 9:
DISTRIBUTION OF TIME SPENT ON ANDROID OEM APP STORES WORLDWIDE (EXCLUDING CHINA)



Source: GOOG-PLAY-002076224.R. Data as of October 2019.

127. Internal Google data

TABLE 1: GOOGLE PLAY SHARE OF APP INSTALLS AND UPDATES ON GOOGLE ANDROID DEVICES WITH GOOGLE PLAY PROTECT ENABLED, WORLDWIDE EXCLUDING CHINA (BILLIONS)

Month	Play Store Count	Play Store Share	Non-Play Store Count	Non-Play Store %
Oct-20	[redacted]			
Nov-20				
Dec-20				
Jan-21				
Feb-21				
Mar-21				
Apr-21				
May-21				
Jun-21				
Jul-21				
Aug-21				
Sep-21				
Oct-21				
Nov-21				
Dec-21				
Jan-22				
Feb-22				
Mar-22				
Apr-22				
May-22				

Source: GOOG-PLAY-011142435.

128. The final two columns above encompass third-party App stores, OEM App stores, sideloaded Apps, and peer-to-peer ("P2P") file sharing protocols such as SHAREit, which Google's documents describe as [redacted].[299] Although P2P file sharing can be used for legitimate purposes, the content shared may be pirated, and can expose users to significant risks such as "Cyber Attacks, Hacking Malware and Viruses Bandwidth Throttling and/or Monitoring by your ISP."[300]

129. Rival App stores such the Amazon Appstore account for only a small share of the Android App Distribution Market. As shown below, from 2016 – 2020, the aggregate number of

299. GOOG-PLAY-000219435 at -9440 [redacted]

300. Ryan McCarthy, *Is BitTorrent Safe?* DOWNLOAD PRIVACY (April 22, 2020), https://www.downloadprivacy.com/is-bittorrent-safe ("The most common dangers of using Bittorrent and downloading torrents can be broken down into a few categories. We will list them here and then explore them in more detail below. The risks of BitTorrent include: Cyber Attacks, Hacking Malware and Viruses Bandwidth Throttling and/or Monitoring by your ISP Legal Risk…"). *See also* Alicia Hope, "SHAREit Android File-Sharing App Security Flaw Exposes Users to Remote Code Execution and Sensitive Data Leaks," *CPO Magazine* (Feb. 22, 2021), https://www.cpomagazine.com/cyber-security/shareit-android-file-sharing-app-security-flaw-exposes-users-to-remote-code-execution-and-sensitive-data-leaks/; *see also* Kapersky Cybersecurity, *What Is BitTorrent and Is It Safe?*, https://www.kaspersky.com/resource-center/definitions/bittorrent ("Torrenting should be approached with caution. BitTorrent has a reputation as a technology used to pirate movies, games, and other copyrighted content. ISPs know this and often send warning letters and anti-piracy educational materials to BitTorrent users.").

initial downloads through the Amazon Appstore represented [redacted]

TABLE 2: INITIAL DOWNLOADS, WORLDWIDE EXCLUDING CHINA (MILLIONS)

Year	Amazon Appstore	The Play Store	Amazon Appstore %
2016	[redacted]		
2017			
2018			
2019			
2020			

Sources: AMZ-GP_00001836, GOOG-PLAY-000808464.

130. The remaining App store rivals also have small shares of the Android App Distribution Market. As seen below, [redacted]

FIGURE 10: THIRD-PARTY APP STORE SHARE OF INITIAL DOWNLOADS ON GOOGLE ANDROID DEVICES – WORLDWIDE (EXCLUDING CHINA), JUL. 2019 – DEC. 2020

[redacted]

Sources: GOOG-PLAY-011127880; GOOG-PLAY-000808464.

131. App store rivals lack many of the popular Apps available in the Play Store. For example, as seen below, eight of the ten most-downloaded Apps in the Play Store as of mid-2022

were not available on the Galaxy Store. Similarly, only eight of the top 20 most-downloaded Play Store Apps were also available in the Galaxy Store.

TABLE 3: MOST TOP PLAY STORE APPS NOT AVAILABLE IN GALAXY STORE

Play Store Download Rank	App Name	In Galaxy Store?
1	WhatsApp	No
2	Facebook	No
3	Facebook Messenger	No
4	Instagram	Yes
5	Garena Free Fire: Rampage	No
6	TikTok	Yes
7	Candy Crush Saga	No
8	Subway Surfers	No
9	Snapchat	No
10	Spotify	No
11	UC Browser	Yes
12	Facebook Lite	No
13	Twitter	Yes
14	My Talking Tom	No
15	SHAREit	Yes
16	Viber	Yes
17	Netflix	No
18	MX Player	Yes
19	Skype	Yes
20	Telegram	No

Sources: AndroidRank, *List of Android Most Popular Google Play Apps*, androidrank.org/android-most-popular-google-play-apps; Dan Price, *The 20 Most Popular Android Apps in the Google Play Store*, MAKEUSEOF (Jul. 23, 2022), https://www.makeuseof.com/tag/most-popular-android-apps/ ; Samsung Galaxy Store, https://galaxystore.samsung.com/. Excludes Google Apps preloaded on Android devices, such as Gmail and Google Maps.

132. Google's conduct vis-à-vis developers—including preventing developers from steering users to rival stores and conditioning developers' access to valuable advertising programs on YouTube and Google Search on the sale and distribution of developers' Apps in the Play Store—has substantially foreclosed potential opportunities for alternative App stores to compete with Google, effectively hindering their ability to develop into viable alternative distribution channels for developers. Absent these provisions, developers would have been more inclined to participate in and promote (via steering) alternative App stores, such as those owned by Amazon.

133. Samsung's Galaxy Store is preinstalled on all Samsung Android devices. However, Samsung's Galaxy Store has not provided effective competition for the Play Store As explained more fully in Part IV.A.2.c below, in part due to Google's conduct, the Galaxy Store has not gained

widespread traction with developers.[301] In addition, since the Galaxy Store appears only on Samsung devices, it is more limited in reach than the Play Store. [redacted].[302]

134. The data also show that non-Galaxy App stores achieved only trivial penetration, as they have been pre-loaded on fewer than [redacted] of all Android devices. [redacted][303]

TABLE 4: SHARE OF ACTIVE ANDROID DEVICES WITH ALTERNATIVE APP STORES

Year	Amazon	LG	Galaxy
2018	[redacted]		
2019			
2020			
2021			

Source: GOOG-PLAY-007203253.

135. With respect to entry barriers, as a two-sided platform, the Play Store benefits from indirect network effects, which serve to entrench its market power.[304] Apps attract users, which in turn attract developers, a virtuous cycle that rewards first movers and thwarts later potential entrants. [redacted].[305] In addition, Google Android's significant share of the number of all mobile devices, [306] means that developers have strong incentives to make their apps Android-compatible to cover the fixed costs of App development. Thus, developers effectively must list their Apps on the Play Store and agree to its restrictive conditions, including the prohibition on steering users to rival App stores. These restrictions therefore act as substantial barriers to entry for effective competition from rival App stores.

136. The impact of indirect network effects in the Android App Distribution Market is reflected in these statistics: the Play Store offered 3.5 million Apps by the second quarter of 2022,[307] the most of any App store in the Android App Distribution Market. In comparison, the Amazon Appstore offered approximately 460,000 Android Apps.[308] Google recognizes the power

301. *See, e.g.,* Daria Dubrova, *9 Alternative Android App Stores*, THE APP SOLUTIONS, theAppsolutions.com/blog/marketing/alternative-android-app-stores/ ("From the company that manufacturers the most Android phones it is no surprise that Samsung has developed their own App store. Compared to other App stores, Samsung Galaxy Apps has a relatively small number of Apps but this can be positive for Apps to stand out.").

302. Koh Dep. 323:3-23 ([redacted]).

303. GOOG-PLAY-007203253.

304. *See generally* Jean-Charles Rochet & Jean Tirole, *Platform Competition in Two-Sided Markets*, 1(4) EUROPEAN ECONOMIC ASSOCIATION 990 (2003) [hereafter Rochet & Tirole].

305. GOOG-PLAY-000879194.R [redacted]

306. Statista, *Market share of mobile operating systems worldwide 2012-2022* (Aug. 30, 2022), statista.com/statistics/272698/global-market-share-held-by-mobile-operating-systems-since-2009/

307. *See* Statista, *Number of apps available in leading app stores as of 2nd quarter 2022*, statista.com/statistics/276623/number-of-Apps-available-in-leading-app-stores/.

308. *Id.*

of network effects in giving its store an advantage: [redacted]"[309] Google also admits significant impediments to competition, [redacted].[310] As one Amazon document explained, [redacted]"[311]

137. The entry barriers in the Market for Licensed Mobile Operating Systems, reviewed in Part I.C.2.a above, also serve as entry barriers in the Android App Distribution Market. For example, if a rival mobile operating system were to gain substantial market share, competitive App stores in the Android App Distribution Market could distribute their Apps through the rival OS.

b. High Profit Margins

138. According to Google's compilations of its profit-and-loss statement for the Play Store, excluding ads, Google earned an operating profit of [redacted].[312] Google's operating profit from the Play Store, again excluding ads, [redacted].[313] The Play Store's gross profit margin in 2020 was [redacted].[314] A separate spreadsheet shows that, [redacted].[315] In 2021, the Play Store's gross profit margin was [redacted], its operating profit margin was [redacted], and its operating profit was [redacted].[316] In 2021, Google [redacted]

309. GOOG-PLAY-000879194.R at -207.R.
310. *Id.* at -204.R.
311. AMZ-GP_00001672 at -1673 [redacted]
312. GOOG-PLAY-000416245.
313. *Id.*
314. *Id.*
315. GOOG-PLAY-001090227 ([redacted]). These data imply that, in 2020, Google earned a gross margin on Play Store advertising revenue of [redacted] Similarly, the 2020 operating margin inclusive of direct costs is [redacted], and the 2020 operating margin inclusive of direct costs and cost allocations is [redacted]
316. GOOG-PLAY-010801682 ([redacted]).

[redacted].[317] Google has projected that the Play Store's operating income [redacted][318]

139. Even these figures are conservative because they do not reflect the Play Store's additional contributions to Google's core advertising business. Google uses the Play Store to collect and monetize valuable information on mobile users, just as it does with other components of the GMS suite such as Google Maps. Google has developed a device identifier known as the Android Advertising ID, to be used for "Advertising and Analytics purposes."[319] [redacted].[320] Google has integrated the Android Advertising ID into Google AdMob ("AdMob"), a mobile advertising subsidiary that Google markets to developers as a tool for "maximi[zing] your ad revenue."[321] According to Google, "[a]s one of the largest global ad networks, AdMob works with millions of advertisers to compete for your ad space[.]"[322] Google does not directly charge developers for Admob,[323] but instead takes a commission of approximately 30 percent of advertising revenue.[324] Admob is part of the Google Network, which generated $23 billion in revenue in 2020.[325]

III. GOOGLE'S MONOPOLY POWER IN THE IN-APP AFTERMARKET

140. In this section, I demonstrate that the In-App Aftermarket, defined as the aftermarket for services in support of consummating purchases of In-App Content on Android devices, is a distinct relevant antitrust market. I also demonstrate that Google has monopoly power in this market.

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317. GOOG-PLAY-010801680 ([redacted]).

318. GOOG-PLAY-010371364 at -376.

319. GOOG-PLAY-006418378.R, at 8379.R *See also* John Koetsie, "Mobile Tutorial Series – What is a Google advertising ID or GAID?" (September 22, 2020), : https://www.singular net/blog/google-advertising-id-gaid/ ("The Google advertising ID is a device identifier for advertisers that allows them to anonymously track user ad activity on Android devices")

320. GOOG-PLAY-000891892 at -896 [redacted]).

321. *See* Google AdMob, *Discover the AdMob advantage*, admob.google.com/home/admob-advantage/.

322. *Id. See also* Google AdMob, admob.google.com/home/.

323. *See* Google AdMob, *Discover the AdMob advantage*, admob.google.com/home/admob-advantage/.

324. Paresh Dave, *Google's App network quietly becomes huge growth engine*, REUTERS (Feb. 15, 2018), reuters.com/article/us-alphabet-admob/googles-app-network-quietly-becomes-huge-growth-engine-idUSKCN1FZ0F9 ("[A]s consumers migrate from desktop computing to mobile, momentum has shifted to Admob, Google's mass-market tool for third-party Apps, and DoubleClick for Publishers, its higher-end mobile software…Google gives developers about 70 cents of every $1 it collects from ad buyers.")

325. *See, e.g.*, Megan Graham & Jenifer Elias, *How Google's $150 billion advertising business works*, CNBC (May 18, 2021), cnbc.com/2021/05/18/how-does-google-make-money-advertising-business-breakdown-.html ("The third main component of Google's advertising revenue is the Google Network, which at $23 billion in 2020 made up about 16% of its total ad revenues. This bucket includes revenue generated from selling ads outside of Google's own properties. Generally speaking, publishers or App makers can use Google platforms such as AdSense, Google Ad Manager, or AdMob to offer ad slots up for sale to advertisers. Publishers use these tools to manage their campaigns, while turning some inventory over to Google to match with advertisers. The publishers and Google split the revenue in various proportions depending on how much work each party is doing.")

A. The In-App Aftermarket Is a Distinct Relevant Antitrust Market

141. After a consumer has examined the available options on the Play Store, selected an App, and downloaded it to her device, the developer may choose to offer In-App Content for purchase and download. Such content can include, among others, access to an ad-free version of the App; videos or interactive programs that run within the App; or avatars, tokens, or other accessories used for in-App gameplay. When Apps are free, the sale of In-App Content is often a major way for developers to earn revenue. Indeed, record evidence suggests [redacted].[326]

142. To provide In-App Content, developers must be able to authorize consumers to use such content and consumers must be able to pay for it. Payment systems require software that securely verifies and accepts customer purchases and may perform other related functions such as storing information about users and their purchasing history or tracking payment histories. Payment systems are also keyed to trigger the unlocking and authorization for the delivery of In-App Content once it is purchased and paid for by consumers. That is, distribution of In-App Content is not complete until the consumer can use those items, and that does not occur until payment is processed and the feature is unlocked.[327]

143. The Play Store is not needed in these In-App Aftermarket services, as the matchmaking function is not present. Thus, the one-sided In-App Aftermarket is distinct from the two-sided Android App Distribution Market. *See* Part III.A, *supra.* Lawrence Koh, former Global Head of Games Business Development at Google, testified that, [redacted].[329] I also understand that Professor Schmidt finds that, as a technological matter, there is no basis for Google to insert itself into the In-App Aftermarket by requiring that developers use Google Play Billing.

1. The In-App Aftermarket Is One-Sided

144. When it comes to the purchase of In-App Content, the customer and the developer have already found each other. The derived demand for services in support of the purchase of In-App Content in the In-App Aftermarket thus lacks any indirect network efforts: adding more consumers or developers does not add value to the relationship between a developer-customer pair or the associated services in support of consummating in-App transactions. Matchmaking services, critically present in the Android App Distribution Market, are not present in the In-App Aftermarket. And the Android App Distribution Market does not provide services sufficient to complete the delivery of In-App Content to the consumer. The In-App Aftermarket is therefore economically distinct from the two-sided platform market contemplated in *Ohio v. American Express* ("*Amex*"), in which the Supreme Court emphasized the determinative role of "indirect

326. GOOG-PLAY-000379093.
327. I understand that Professor Schmidt's findings support this conclusion.
328. Koh Dep. 381:4-382:6.
329. *Id*. at 383:3-21.

network effects,"[330] which "exist where the value of the two-sided platform to one group of participants depends on how many members of a different group participate."[331] According to the Supreme Court, when "the indirect network effects operate in only one direction," the market "behaves much like a one-sided market and should be analyzed as such."[332]

2. There is Separate Demand for In-App Aftermarket services

145. Record evidence confirms that there is separate demand for In-App Aftermarket services.[333] In 2011, around the time that Google first introduced its own payments system for the purchase of In-App Content, Google [redacted]"[334] A 2021 Google slide deck [redacted][335] According to this document, [redacted]"[336] Thus, Google recognizes that [redacted].[338]

146. Netflix's refusal to use Google Play Billing also demonstrates the existence of separate demand. [redacted][339] Internal Netflix documents indicate [redacted]

330. *Ohio v. American Express Co.*, 138 S.Ct. 2274, 2280 (2018).

331. *Id.*

332. *Id.* at 12-13 ("To be sure, it is not always necessary to consider both sides of a two-sided platform. A market should be treated as one-sided when the impacts of indirect network effects and relative pricing in that market are minor. Newspapers that sell advertisements, for example, arguably operate a two-sided platform because the value of an advertisement increases as more people read the newspaper. But in the newspaper-advertisement market, the indirect network effects operate in only one direction; newspaper readers are largely indifferent to the amount of advertising that a newspaper contains. Because of these weak indirect network effects, the market for newspaper advertising behaves much like a one-sided market and should be analyzed as such.") (citations omitted).

333. *See, e.g.,* GOOG-PLAY-000260305 ([redacted]). *See also* GOOG-PLAY-002440706 ([redacted].

334. GOOG-PLAY-004320094.

335. GOOG-PLAY-006829073.R at -159.R. *See also Id.* at -153.R [redacted]

336. *Id.* at -097.R, -103.R.

337. GOOG-PLAY-003334312 at -314.

338. *Id.* at -323, -347.

339. NETFLIX-GOOGLE-00000022 at -27 [redacted]). *See also* Ron Amadeo, *Google announces crackdown*

[redacted].[343] A July 2018 Netflix slide deck [redacted]"[344]

147. In 2019, the developer Magic Lab was [redacted][46] Record evidence indicates that [redacted]"[348]

148. The developer Match.com has indicated to Google that being required to use Google Play Billing would have a significant negative impact on its customers.[349] Match [redacted]

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on in-App billing, aimed at Netflix and Spotify, ARSTECHNICA (Sep. 29, 2020), arstechnica.com/gadgets/2020/09/google-announces-crackdown-on-in-app-billing-aimed-at-netflix-and-spotify/ ("Today, Netflix and Spotify don't use Google's in-App billing and instead kick new accounts out to a Web browser, where the companies can use PayPal or direct credit card processing to dodge Google's 30-percent fees.").

340. NETFLIX-GOOGLE-00000002 ([redacted]

341. *Id.* at -02-05.

342. NETFLIX-GOOGLE-00000030. *See also* NETFLIX-GOOGLE-00000029 (spreadsheet of underlying data).

343. NETFLIX-GOOGLE-00000015 at -15-17.

344. NETFLIX-GOOGLE-00000022 at -23. *See also* NETFLIX-GOOGLE-00000019 (spreadsheet of underlying data).

345.GOOG-PLAY-011274411.

346. *Id*.

347. *Id*.

348. GOOG-PLAY-011380975 at -976—977.

349.GOOG-PLAY-011275555.

[redacted]"[350] Match.com estimated that [redacted][351]

149. Google's announcement requiring the exclusive use of GPB for purchases of digital goods and services, includes a set of FAQs and proposed responses that recognize the limitations of GPB.[352] [redacted]."[355]

150. Moreover, I understand that Professor Schmidt finds that, as a technological matter, there is no basis for Google to insert itself into the In-App Aftermarket by requiring Google Play Billing be used when consumers purchase In-App Content on Play-distributed apps. Google's forced insertion into the In-App Aftermarket is properly analyzed as an anticompetitive extension of the power it possesses in the separate and distinct Android App Distribution Market. My analysis first examines these two relevant markets, and my models of impact are aimed at these markets separately, with a few caveats. To model the scenario where rival App stores compete on the dimension of a consumer subsidy (rather than on take rates), I treat the two markets as a single market, under the assumption that any enhanced consumer discounts could be used by consumers for both paid initial downloads and the purchase of In-App Content. I also offer a model in which rival App stores compete on the take rate assuming (in the alternative) the two markets are a single market.

3. Standard SSNIP Test Demonstrates the In-App Aftermarket Is a Relevant Antitrust Market

151. A standard SSNIP test confirms that the In-App Aftermarket is a relevant antitrust product market:

- In a more competitive but-for world, the take rate in the In-App Aftermarket would be approximately 14.4 percent. (*See* Table 8, *infra*).
- A hypothetical five percent increase above competitive levels would increase the take rate to approximately 15.1 percent (equal to 0.144 x [1.05]), which is far below Google's 30 percent headline take rate.

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350. *Id*. at -558.
351. *Id*. at -559.
352.GOOG-PLAY-011394225.
353. *Id*. at -228.
354. *Id*. at -230—231.
355. *Id* at -231—232 ([redacted]).

- Therefore, Google could (and did) profitably maintain the take rate in the In-App Aftermarket far above competitive levels for the duration of the Class Period.

- Consequently, a (not-so) hypothetical monopolist could profitably impose a SSNIP on the price charged to developers in the In-App Aftermarket.

152. Google uses its contracts with developers to control the In-App Aftermarket. Initially, Google requires that, if an App is offered through the Play Store, the developer must use Google Play Billing for all consumer purchases of In-App Content.[356] Google utilizes Google Play Billing to impose a general take rate of 30 percent (with the aforementioned exceptions)—the same take rate it commands in the Android App Distribution Market—on all such purchases in perpetuity.[357]

153. Absent Google's restrictions, competition would materialize and there would be alternative providers of In-App Aftermarket services, including authorization and payment systems. And record evidence shows that developers seek those services from third parties,[358] consistent with the notion of a *demand separate* from the matchmaking service offered via the App store in the Android App Distribution Market. The developer's demand for those services is derived from the consumer's demand for In-App Content. That numerous major developers have gone through the effort to use other systems, and to steer users to those systems (see Part V.B below), provides economic evidence that there is market demand for the In-App Aftermarket services separate from the matchmaking services provided in the Android App Distribution Market.[359] Potential competitors include the major payment systems now used for online Internet

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356. Google Developer Program Policy (effective Dec. 1, 2021), support.google.com/googleplay/android-developer/answer/11498144?hl=en&visit_id=637814760589469507-2803788482&rd=1. *See also* my discussion earlier in Part V.A.

357. *See* Google Play, *Google Play has something for everyone,* play.google.com/about/howplayworks/?section=about-google-play&content=service-fee. The service fee applies if developers "sell subscriptions or other digital content within an app," but is not affected by the length of time after an App is downloaded – with the exception of subscription products, which face a lower service fee after being retained for over a year. *See* Play Console Help, *Service fees*, support.google.com/googleplay/android-developer/answer/112622?hl=en.

358. *See, e.g.,* Koh Dep. 183:14-18 [redacted]; Kevin Wang Dep. 94:14-21 ([redacted]). *See also* GOOG-PLAY-000259276 [redacted]; GOOG-PLAY-004703579 at -584 ([redacted]; GOOG-PLAY-004716632 ("[redacted]"); GOOG-PLAY-004721177 [redacted]"); GOOG-PLAY-006817773.R at -802.R ([redacted]).

359. Although Google may have alleged security justifications for approving distribution methods of In-App Content, this can easily and less restrictively be accomplished by white-listing developers, a process that Google already conducts for OEMs, and by providing developers with certificates approving their security so that developers can use them with other payment processors.

purchases, such as credit and debit card networks, PayPal, distribution and payment systems used by other App stores, or developers themselves. I understand that Professor Schmidt finds that the software required for in-app purchases is already widely accessible and used for many online transactions and could readily be adapted to facilitate the purchase of In-App Content. Google froze out competitors by requiring that all developers use Google Play Billing, Google's own provider of services for the fulfillment and consummation of transactions for all In-App Content purchased in Apps that were downloaded from the Play Store. Notably, in discussions with PayPal, Google considered a scenario in which PayPal could directly unlock and distribute In-App Content without Google Play Billing.[360] [redacted].[362]

154. Google's prohibition of developer steering of consumers to outside authorization and payment channels indicates that third-party providers could replicate Google's authorization and payment channel for In-App Content and that [redacted].[364] [redacted]"[365]

155. Multiple internal analyses conducted by Google [redacted].[366] Likewise, a 2021 Google

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360. GOOG-PLAY-005653612.R at -617.R [redacted]

361. Feng Dep. 522:12-19 [redacted]

362. *See* PayPal, "An app for the everyday," https://www.paypal.com/tc/webapps/mpp/shop/apps ("We're integrated into thousands of iOS and Android apps. Use our apps to shop on the go, make your travel reservations, or make payments abroad.")

363. *See* Google Play Payments Policy §4, https://support.google.com/googleplay/android-developer/answer/9858738?visit_id=637994598201252840-4239604614&rd=1 ("Other than the conditions described in Section 3 and Section 8, apps may not lead users to a payment method other than Google Play's billing system. This prohibition includes, but is not limited to, leading users to other payment methods via: • An app's listing in Google Play; • In-app promotions related to purchasable content; • In-app webviews, buttons, links, messaging, advertisements or other calls to action; and • In-app user interface flows, including account creation or sign-up flows, that lead users from an app to a payment method other than Google Play's billing system as part of those flows.")

364. Various developers have indicated a desire to use their own transaction services, declining the use Google Play Billing. [redacted] See, e.g., GOOG-PLAY-000258923 at -924 [redacted]; GOOG-PLAY-000840773 at -774 [redacted]); GOOG-PLAY-003334312 at -316 ([redacted]); GOOG-PLAY-004470512 at -513 ([redacted]).

365. GOOG-PLAY-000259276 at -277.

366. GOOG-PLAY-000542516.R at -532.R ([redacted]).

analysis [redacted][367] Google's internal analyses [redacted]. These competitive analyses further demonstrate that [redacted].

156. Further, Google's documents recognize the possibility that payment systems for In-App Content could turn into full-blown competitive App stores. A Google document noted that "preventing payment circumvention" for In-App Content could reduce the possibility that a nascent competitor in the In-App Aftermarket would expand to be a full-bore App store competitor in the adjacent Android App Distribution Market.[368]

157. Google's efforts to prevent selected developers from circumventing Google Play Billing and using alternative means of authorization and payment processing for In-App Content is yet additional evidence that there are actual or potential competitors to Google's services for these items, and thus that there is a separate and distinct In-App Aftermarket. Google's documents also provide evidence that, [redacted][369] This exercise demonstrates that Google recognized that authorization and payment processing for In-App Content is distinct from what it provides through the Play Store.

B. The Relevant Geographic In-App Aftermarket Is Global (Excluding China)

158. The geographic market for the In-App Aftermarket is also global (excluding China). If Google's restrictions were not in place, it would not require any increase in Google's current take rates to attract entrants from other countries into the In-App Aftermarket. One such provider, Coda Payments, is already active in Asia, [redacted].[370] Thus, the geographic In-App Aftermarket is not limited solely to the United States but is worldwide (excluding China).

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367. GOOG-PLAY-007745829 ([redacted]).

368. GOOG-PLAY-004564758. [redacted] *Id.* at -761. [redacted] *Id.* This is a similar anticompetitive theory of harm as that pursued by the Department of Justice (DOJ) in the *Microsoft* antitrust litigation, in which the dominant operating system tied its browser to its operating system with the alleged aim of preventing a rival browser from evolving into a full-bore competitor for Microsoft's operating system (or what the DOJ called "middleware"). *See U.S. v. Microsoft*, 253 F.3d 34 (D.C. Cir. 2001).

369. GOOG-PLAY-006829073 ([redacted]).

370. EPIC_GOOGLE_00108372 ([redacted]). Other international in-App payment processors include Judopay (www.judopay.com/about), Paysafe (www.paysafe.com/us-en/), and Adyen (www.adyen.com/about)). *See also* GOOG-PLAY-006829073.R at -152.R-153.R ([redacted]).

C. Google's Market Power in the In-App Aftermarket

159. As with the Android App Distribution Market, I assess Google's power in the In-App Aftermarket through direct proof of firm-specific measures that speak directly to a firm's ability to profitably raise prices.[371] In Part VI.C below, I show that Google would be forced to reduce its take rate in the In-App Aftermarket absent its restraints, which is also direct evidence of its market power. That Google is able to impose restrictions on developers that exclude competition also evidences Google's power. I also examine indirect evidence—market shares and entry barriers—to establish that Google has market power in the In-App Aftermarket.

1. Direct Evidence: Ability to Exclude Rivals and Charge Supracompetitive Prices

160. Through the Aftermarket Tie-In, Google has excluded nearly all rivals from the In-App Aftermarket. As of September 2020, only about three percent of developers in the Play Store were using payment processors other than Google Play Billing for purchases of In-App Content; at this time, Google gave this remaining three percent one year to drop these In-App Aftermarket rivals in favor of Google Play Billing.[372]

161. Google's foreclosure of Epic from the In-App Aftermarket illustrates its monopoly power. Google removed the Fortnite App from the Play Store after Epic introduced its own payment system on Android, offering users discounts of up to 20 percent on purchases of Fortnite's in-game currency (which is used for purchasing In-App Content) if they chose to use Epic's payment system instead of Google Play Billing.[373]

162. Google's 30 percent standard take rate for initial downloads and purchases of In-App Content is direct evidence of its market power in the In-App Aftermarket. In the Android App Distribution Market, the Play Store brings together consumers and developers in a matchmaking

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371. Herbert Hovenkamp, *Digital Cluster Markets*, 1 COLUMBIA BUSINESS LAW REVIEW 246, 272 (2022). ("By contrast, 'direct' proof relies on estimates of firm elasticity of demand, evidenced mainly by a firm's price-cost margins or output responses to price changes.[] These methodologies are capable of giving more accurate measures of market power as it is best defined—the ability of a firm to profit by raising its price above its costs.[]") citing 2B Phillip E. Areeda & Hebert Hovenkamp, ANTITRUST LAW ¶521 (5th ed. 2021) (forthcoming); Louis Kaplow, *Why (Ever) Define Markets?,* 124 HARVARD LAW REVIEW 437 (2010).

372. *See* Sameer Samat, *Listening to Developer Feedback to Improve Google Play*, ANDROID DEVELOPERS BLOG (Sept. 28, 2020), android-developers.googleblog.com/2020/09/listening-to-developer-feedback-to.html. ("Less than 3% of developers with apps on Play sold digital goods over the last 12 months, and of this 3%, the vast majority (nearly 97%) already use Google Play's billing."). Google later announced that, although many of the holdouts "have been making steady progress" toward compliance with the In-App Aftermarket Tie-In, it would grant an extension to its original compliance deadline. *See* Purnima Kochikar, *Allowing developers to apply for more time to comply with Play Payments Policy*, ANDROID DEVELOPERS BLOG (Jul. 16, 2021), android-developers.googleblog.com/2021/07/apply-more-time-play-payments-policy.html. This extension was granted after Google was sued by 36 state attorneys general over the In-App Aftermarket Tie-In and other practices. *See* Tim De Chant, *Google "bought off Samsung" to limit app store competition, 36 states allege*, ARS TECHNICA (Jul. 8, 2021), arstechnica netblogpro.com/tech-policy/2021/07/google-bought-off-samsung-to-limit-app-store-competition-36-states-allege/.

373. Amanda Yeo, *'Fortnite' has now been punted from the Google Play Store as well*, MASHABLE (Aug. 13, 2020), mashable.com/article/fortnite-android-google-play-store. *See also* Todd Haselton, *Fortnite maker challeneges Apple and Google's app store rules through direct-payment discounts*, CNBC (Aug. 13, 2020), cnbc.com/2020/08/13/fortnite-discount-appears-to-break-apple-google-app-store-rules html.

role, though in many cases the consumer would be aware of the App she sought before searching for it in the Play Store, suggesting a more modest contribution by Google to value added.[374] In contrast, there is no matchmaking role in the purchase of In-App Content or for the services in support of consummating those purchases in the In-App Aftermarket.

163. Because Google as an intermediary provides additional value in the Android App Distribution Market via matchmaking, one would expect that, as in competitive markets where the take rate reflects the value added by the intermediary, the take rate in the Android App Distribution Market would exceed any take rate in the In-App Aftermarket. That Google's take rate—a price that presumably reflects its value-added to the transaction—is the same for initial downloads and purchases of In-App Content made even five years later strongly suggests that Google has anticompetitively extended its market power from the Android App Distribution Market into the In-App Aftermarket.

164. Indeed, a Google document shows that [redacted], suggesting that Google possesses market power. In a 2020 business strategy document [redacted].[376] Google estimated that [redacted].

165. Google's ability to price discriminate also evidences its market power. Basic economic principles tell us that "[f]or a firm to price discriminate, it must have some market power."[378] In a document titled [redacted] Google recognized that [redacted].[379] Google even noted that [redacted].[380] [redacted]

374. Google's documents [redacted] GOOG-PLAY-007317574 at -585. A 2020 survey found that [redacted] *Id.* at -578. [redacted] *Id.* at -584. [redacted] *Id.* at -591.

375. GOOG-PLAY-006990552 at -553.

376. *Id.* [redacted]

377. *Id.* [redacted]

378. N. GREGORY MANKIW, PRINCIPLES OF MICROECONOMICS 303-304 (Cengage Learning 8th ed. 2018) [hereafter MANKIW] ("price discrimination is not possible when a good is sold in a competitive market"; "For a firm to price discriminate, it must have some market power.").

379. GOOG-PLAY-007329063.

380. *Id.* at -066.

[redacted]. [384]

166. [redacted]

381. *See* Defendants' Answers and Objections to Developer Plaintiffs' First Set of Interrogatories to Defendants (July 6, 2021) at 13-16. *See also* Google Play Console, *Play Media Experience Program*, play.google.com/console/about/mediaprogram/.

382. GOOG-PLAY-000259276 at -277 [redacted]).

383. [redacted] GOOG-PLAY-007271978 at 78-79. [redacted] *See, e.g.,* GOOG-PLAY-007271978 ([redacted]); GOOG-PLAY-007272461 [redacted]; GOOG-PLAY-007317231 ([redacted] GOOG-PLAY-007317239 ([redacted] GOOG-PLAY-009214128 ([redacted]

384. GOOG-PLAY-009214167 ([redacted]. *See also, e.g.,* GOOG-PLAY-007505091 ([redacted]).

385. GOOG-PLAY-007335282 ([redacted]. *Id.* at -82-83. [redacted] *See, e.g.,* GOOG-PLAY-007272709 and GOOG-PLAY-007272817. [redacted]. GOOG-PLAY-007273682.

[redacted].[386] Google's ability to target specific price breaks and benefits to different customer types through these various programs attests to its market power.

167. [redacted]

168. Record evidence indicates that Google offered a few select developers even lower take rates. According to one document, [redacted]"[389] [redacted].[390] The same witness testified that [redacted]

386. [redacted] *See, e.g.,* GOOG-PLAY-007272068 ([redacted]); GOOG-PLAY-007505116 ([redacted]. [redacted] GOOG-PLAY-011124910. [redacted]. *Id.*

387. [redacted]. *See, e.g.*, GOOG-PLAY-010511101 ([redacted]).

388. GOOG-PLAY-007273439 at -40-41; GOOG-PLAY-007847579 at -79-80; GOOG-PLAY-000512004 at -04.

389. GOOG-PLAY-006381385 at -387.

390. *See* Alzetta Rough Dep. Tr. 42:10-43:17 ("[redacted]).

[redacted]"[391] Google has also cut in half the take rate for subscriptions, which are not limited to mobile devices. For subscriptions the platform is not as important, and they could command a lower rate. That Google is able to cut special deals below its standard 30 percent take rate for developers with recurring subscriptions or with streaming Apps with large content costs[392] is also consistent with Google having market power. A firm that lacks market power would not enjoy the privilege of discriminating across customer types according to their willingness or ability to pay, but instead would be forced to charge a uniform price at competitive levels.

2. Indirect Evidence

a. High Market Share and Entry Barriers

169. Google accounts for the vast majority the In-App Aftermarket. For example, the Amazon Appstore had total consumer expenditure—across all devices—[redacted][393] In that year, Google's consumer expenditures in the In-App Aftermarket were [redacted].[394] [redacted].[395] As seen below, from 2018 to 2021, the Amazon Appstore's worldwide revenue outside of China [redacted]. Even these estimates are conservatively high, given that the Amazon Appstore's In-App aftermarket revenues on Google Android devices are [redacted] of its total revenue.[396]

391. *See* Alzetta Rough Dep. Tr. 45:18-46:10 [redacted]).

392. *See, e.g.,* Kif Leswig, *Bumble, Duolingo lead rally in shares of App developers after Google slashes subscription fees*, CNBC (Oct. 21, 2021), cnbc.com/2021/10/21/google-cuts-app-store-fees-lifting-shares-of-app-developers.html.

393. AMZ-GP_00005729. [redacted]

394. Sensor Tower, *2022 – 2026 Mobile Market Forecast,* (2021) at 6, go.sensortower.com/rs/351-RWH-315/images/Sensor-Tower-2022-2026-Market-Forecast.pdf. *See also* Sensor Tower, *5-Year Market Forecast: App Spending Will Reach $233 Billion by 2026,* (2022), sensortower.com/blog/sensor-tower-app-market-forecast-2026.

395. For the Amazon Appstore, *see* AMZ-GP_00002484 at -2488 [redacted]). For the Play Store, *Compare* Table 6, row [1] with Table 8, row [1].

396. AMZ-GP_00002471 (Morrill Exhibit 1363) [redacted]).

FIGURE 11: AMAZON APPSTORE CONSUMER EXPENDITURE AS A PERCENTAGE OF GOOGLE PLAY STORE CONSUMER EXPENDITURE (WORLDWIDE)

Sources: AMZ-GP_00002471; AMZ-GP_00001497; GOOG-PLAY-010801685; GOOG-PLAY-010801686.R.
Note: Google Play figures exclude China; Amazon figures do not.

170. Record evidence indicates that Samsung's share of the In-App Aftermarket is [redacted] As seen below, consumer expenditures in the Samsung Galaxy Store are [redacted] of those in the Play Store in the U.S.[397]

397. Samsung produced Galaxy Store consumer expenditures limited to the U.S.

FIGURE 12: SAMSUNG GALAXY STORE CONSUMER EXPENDITURE AS A PERCENTAGE OF GOOGLE PLAY STORE CONSUMER EXPENDITURE (U.S.)

Sources: SEA_EpicProduction_000089; Google Transaction Data.

171. Moreover, the evidence reviewed in Part II.C.2 above shows that that Play Store accounts for the vast majority of initial downloads on Google Android devices worldwide, which implies that the vast majority of In-App transactions on Google Android devices flow through Google Play Billing. Accordingly, Google has a dominant share of the In-App Aftermarket.[398]

172. Google's In-App Aftermarket Tie-In serves as an artificial barrier to entry in the In-App Aftermarket. Absent this restraint, alternative providers could enter and provide competitive services in support of purchases of In-App Content. The entry barriers for the Android App Distribution Market, described in Part II.C.2.a above, also serve as entry barriers to providers of In-App Aftermarket services. For example, if a rival App store were to gain substantial market share, competitive providers of In-App Aftermarket services could facilitate purchases of In-App Content in the rival store.

b. High Profit Margins

398. As explained in Part V.B.1 below, the ability of a small number of large developers such as Netflix and Spotify to avoid the Aftermarket Tie-In by using their own payments systems does not negate Google's dominance in the In-App Aftermarket. The vast majority of developers in the Play Store are compelled to comply with the In-App Aftermarket Tie-In, and would be excluded from the Play Store if did not comply.

173. As explained in Part II.C.2.b above, Google's financial records confirm that Play Store is highly profitable. These financial records include the In-App Aftermarket, which accounts for the vast majority of transactions and revenue in the Play Store.

IV. GOOGLE'S ANTICOMPETITIVE CONDUCT IN THE ANDROID APP DISTRIBUTION MARKET

174. For the reasons given below, I conclude that Google has engaged in anticompetitive conduct as a means of furthering and retaining its monopoly power in the Android App Distribution Market. In a more competitive but-for world, the Play Store would have competed on the merits with its rivals in the Android App Distribution Market.

A. Google's Exclusionary Conduct in the Android App Distribution Market

175. Anticompetitive exclusionary conduct occurs when a firm impairs its rivals' ability compete instead of competing on the merits. Anticompetitive exclusionary conduct by dominant firms can maintain and enhance monopoly power, harming competition generally and consumers in particular.[399]

176. Google's use of various restraints to maintain its dominance in the Android App Distribution Market inhibits competition from rival App stores on mobile devices and from alternative distribution channels such as sideloading of direct downloads from developers' websites.[400] Such competition would enable consumers and developers to readily connect to more than one competitive platform, a practice known as "multi-homing." A developer can take advantage of multi-homing by discounting the price of its Apps to "steer" consumers to use the lower-cost platform. Steering and multi-homing combined generally would lower the equilibrium take rate charged by each platform. While Google has claimed openness to other App stores,[401] I next discuss how it has effectively utilized contractual restrictions and revenue-sharing agreements

399. *See, e.g.,* Jonathan Baker, *Exclusion as a Core Competition Concern* 78(3) ANTITRUST L. J. 527 (2013); *see also* Michael Whinston, *Tying, Foreclosure, and Exclusion* 80(4) AMERICAN ECONOMIC REVIEW 837 (1990); Ilya Segal & Michael Whinston, *Naked Exclusion: Comment* 90(1) AMERICAN ECONOMIC REVIEW 296 (2000); Thomas Krattenmaker & Steven Salop, *Anticompetitive Exclusion: Raising Rivals' Costs To Achieve Power Over Price* 96 YALE LAW JOURNAL 209 (1986).

400. *See, e.g.,* [redacted]

401. *See, e.g.*, Sameer Samat, *Listening to Developer Feedback to Improve Google Play, supra* ("We believe that developers should have a choice in how they distribute their Apps and that stores should compete for the consumer's and the developer's business. Choice has always been a core tenet of Android, and it's why consumers have always had control over which Apps they use, be it their keyboard, messaging app, phone dialer or App store. Android has always allowed people to get Apps from multiple App stores. In fact, most Android devices ship with at least two App stores preinstalled, and consumers are able to install additional App stores. Each store is able to decide its own business model and consumer features. This openness means that even if a developer and Google do not agree on business terms the developer can still distribute on the Android platform. This is why Fortnite, for example, is available directly from Epic's store or from other App stores including Samsung's Galaxy App Store.").

with mobile carriers, OEMs, and developers to restrain competition from other App stores.[402] I also understand that Professor Schmidt finds that Google imposes overly broad technological barriers that inhibit the installation and usage of alternative App stores on Google Android devices, compared with the Play Store.

1. Google's Revenue-Sharing Agreements

177. Before Google had acquired monopoly power in the Android App Distribution Market, Google used revenue-sharing agreements ("RSAs") with major mobile carriers to dissuade competitive entry and expansion by rival App stores. [redacted].[406]

178. [redacted]. According to its financial data, Google's gross profit from the Play Store was [redacted], and operating profit was [redacted].[409] Google's documents indicate that [redacted]

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402. *See, e.g.*, GOOG-PLAY-003776161.R at -176.R ([redacted]).

403. GOOG-PLAY-001400503 at -530 (§ 14.12(b)); GOOG-PLAY4-000284361 at -365.

404. GOOG-PLAY-004542110; GOOG-PLAY-000131205.R at -232.R.

405. ATT-GPLAY-00002235 at -238. [redacted]. *See* GOOG-PLAY-004499366.R at -369.R ([redacted]).

406. *See, e.g.* GOOG-PLAY-001886008.R at -011.R ([redacted]); GOOG-PLAY-000131205.R at -232.R—233.R ([redacted]); GOOG-PLAY-001385324 at -345 ([redacted]).

407. *See* Part V.A.1.a.

408. Average variable cost refers to variable costs divided by the *total* quantity of output produced. Marginal cost refers to the additional cost incurred by producing *one additional unit* of output. There may be certain variable costs such as customer support that Google incurs when output expands considerably, but that are not incurred when output expands by one unit. Thus, Google's average variable cost will always exceed its marginal cost. Because Google continues to incur expenses at the margin such as processing fees for each sale, its marginal costs are a good approximation of its average variable costs.

409. GOOG-PLAY-000416245 ([redacted]).

App transaction involving payment. For instance, an October 2013 presentation indicates that [redacted].[410]

FIGURE 13: GOOGLE'S GROSS MARGINS ON THE PLAY STORE IN 2013

[redacted]

These 2013 figures indicate that [redacted].[411]

179. Based on its financial data, my best estimate is that Google's marginal costs during the period 2016 through 2020 were approximately [redacted], which if applicable earlier would have [redacted]

410. Eric Chu, former Head of the Android Developer Ecosystem, testified [redacted]. Chu Dep. 85:21-86:1. Jamie Rosenberg, VP of Strategy and Operations in Google's Platforms and Ecosystems Division, testified that, [redacted] Rosenberg Dep. 186:4-20. Rosenberg testified that [redacted]. *Id.* at 183:15-22 ([redacted]). Patrick Brady, a Google executive who worked as a liaison between Android Market and OEMs and carriers, testified that [redacted]. Brady Dep. 56:15-20.

411. GOOG-PLAY-004499366.R at -378.R.

[redacted].[412] Moreover, Google's marginal costs likely would have been even higher in earlier years, when the Play Store was operating at a significantly smaller scale.

a. Carrier Revenue-Sharing Agreements Eliminated the Threat of Competition from Mobile Carriers

180. In 2009, Google noted that [redacted]"[413] Record evidence indicates that [redacted]"[414] According to Google, [redacted]

181. Record evidence indicates that Google [redacted].[416] [redacted].[417] As one 2014 Google presentation observed, [redacted].[419] A 2019 Google presentation observes that [redacted][420]

182. [redacted]

412. *See* Table 8, *infra* (showing In-App Aftermarket Impact & Damages (8/16/2016 – 5/31/2022). Row 7 shows marginal cost calculated at [redacted] of consumer expenditures. This includes all direct costs of sales and direct operating expenses. *See also* work papers for this report.

413. GOOG-PLAY-001423609.

414. *Id.*

415. GOOG-PLAY-001381141.

416. *See* Rosenberg Dep. 174:3-181:14; GOOG-PLAY4-000339939; GOOG-PLAY-001381054; GOOG-PLAY-001423609.

417. GOOG-PLAY4-000339939; GOOG-PLAY-001423609.

418. GOOG-PLAY-004565563.R at -567.R.

419. *Id.*; *see also* GOOG-PLAY-001423609; GOOG-PLAY-008427238.

420. GOOG-PLAY-007328714 at -750.

421. GOOG-PLAY-001400503; GOOG-PLAY4-000284361; ATT-GPLAY-00002235; GP MDL-TMO-0080283; GP MDL-TMO-0029572; GP MDL-TMO-0029567; GP MDL-TMO-0029583.

183. According to Tom Moss, Google's Head of Japan new business development, [redacted]. According to one Google document, [redacted].[424] By that point, [redacted] By the time the Android App Distribution Market had "tipped" in Google's favor, there was very little chance that a mobile operator would enter with its own app store. Not only did Google [redacted].[427]

184. Critically important to Google's predatory strategy was to change the rules in the middle of the game, but only after developers were dependent on Google's ecosystem. Google perceived its strategy as [redacted].[430] In June 2009, Google [redacted][431]

422. GOOG-PLAY-001423609.
423. Brady Dep. 138:25-143:14.
424. GOOG-PLAY-001423609 [redacted]).
425. GOOG-PLAY-000443763.R at -772.R.
426. GOOG-PLAY-000416245.
427. Typically, predation is used to denote charging prices below costs. But the term may also refer to a situation when an input provider (here, the carrier or OEM) is paid so much that an equally efficient rival would not find it profitable to match the payment to the input provider while competing, in which case the payments may drive out equally efficient rivals. I understand from Plaintiffs' counsel that, as a legal matter, predation does not require pricing to customers below costs, but also can be established via demonstration that payments to *input providers* do not permit rivals to survive. *See Weyerhaeuser Co. v. Ross-Simmons Hardwood Lumber Co*., 549 U.S. 312, 325 (2007) ("A [predatory-bidding] plaintiff must prove that the alleged predatory bidding led to below-cost pricing of the predator's outputs. That is, the predator's bidding on the buy side must have caused the cost of the relevant output to rise above the revenues generated in the sale of those outputs."). Here, the cost of the relevant output (the cost of operating the Play Store) was approximately [redacted]
428. GOOG-PLAY-001337211 [redacted]) at -226.
429. *Id.*
430. *Id.*
431. GOOG-PLAY-011136256 at -287.

After widespread adoption of Google's Android ecosystem and the Play Store, Google could [redacted][432] In sum, Google's anticompetitive strategy for securing the Play Store's dominance entailed changing the rules after millions of users, multiple carriers, and multiple OEMs had adopted Google's ecosystem.

185. As Google's market power grew, Google [redacted][437] A 2015 internal Google document [redacted]"[438]

186. As actual and potential competition from alternative app stores was eliminated, the carriers had fewer alternatives to the Play Store. As explained below, Google's revenue share agreements also [redacted]. The importance of eliminating competition from carriers is evident in Google's internal documents. [redacted] According to Google, [redacted][440]

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432. GOOG-PLAY-001337211 at -226.
433. ATT-GPLAY-00000692; GP MDL-TMO-0001831; GP MDL-TMO-0002071.
434. ATT-GPLAY-00000692; GP MDL-TMO-0001831; GP MDL-TMO-0002071.
435. GOOG-PLAY-003604606 at -619. AT&T collected [redacted] for direct-carrier billing transactions.
436. GOOG-PLAY-003604601 at -603. AT&T retained [redacted] for direct-carrier billing transactions; ATT-GPLAY-00012846 at -847 ([redacted]).
437. GOOG-PLAY-003605103; GOOG-PLAY4-002178046 at -8049; GOOG-PLAY-002891881 at -882 ([redacted]).
438. GOOG-PLAY4-004677224 at -225; *see also* GOOG-PLAY-001184813 at -823 ([redacted]).
439. GOOG-PLAY-004235359 at -360 (emphasis in original). "MADA" refers to the Mobile Application Distribution Agreement, which is the licensing agreement Google offers OEMs to license Google Mobile Services.
440. *Id.*

187. As explained in Part II.C.2.a, the Android App Distribution Market is characterized by significant the barriers to entry for a rival App store, including strong indirect network effects, which made for a dangerous probability that Google would recoup its early losses. Google's control over mobile devices meant that developers had strong incentives to make their apps Android-compatible; additional apps attracted users, which in turn attracted developers—a virtuous cycle that entrants could not exploit, at least in part due to Google's strategy. Indeed, the probability of recoupment was so high that today we observe no significant competition in the Android App Distribution Market despite the fact that Google has been recouping its initial losses for almost a decade.

188. In short, once indirect network effects kicked in, granting Google an insurmountable monopoly in the Android App Distribution Market, Google was able to [redacted]. As Google executive Jamie Rosenberg reportedly later commented: [redacted][441] Economists recognize how much an early, "first-mover" advantage means to incumbents in the context of network effects.[442]

189. Because Google's revenue-sharing agreements eliminated the threat of competition from mobile carriers (and other potential entrants such as Amazon), [redacted], I conclude that this element of the Challenged Conduct was anticompetitive. Furthermore, Google could have partnered with mobile carriers using less-restrictive alternatives. In a more competitive but-for world, Google could have pursued a non-predatory strategy.[443]

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441. GOOG-PLAY-000439987.R at -40012.R (emphasis added).

442. *See, e.g.*, Agam Gupta et al., *Combating incumbency advantage of network effects: The role of entrant's decisions and consumer preferences*, 20(1) COMPETITION AND REGULATION IN NETWORK INDUSTRIES 3 (2019); Marvin B. Lieberman & David B. Montgomery, *Conundra and progress: Research on entry order and performance*, 46 LONG RANGE PLANNING 312 (2013), sciencedirect.com/science/article/abs/pii/S0024630113000344?via%3Dihub.

443. I have read and considered deposition testimony regarding so-called "walled gardens" operated by wireless carriers before the Play Store achieved dominance in the Android App Distribution Market. For example, Android founder Andy Rubin testified [redacted]. Andy Rubin Dep. 79:16-80:9 [redacted]). According to Mr. Rubin, [redacted] *Id.* 51:34-52:9. To the extent that Google intends to use walled gardens as an efficiency justification for the Challenged Conduct, I do not find it persuasive. This would be tantamount to claiming that competition in App distribution because would have been harmful to consumers. Although it may be that some carriers have restricted the interoperability of ring tone purchases, I have seen no evidence that carrier stores have ever systematically restricted the interoperability of popular third-party Apps such as Facebook, Netflix, and so on. [redacted] *See* GOOG-PLAY-001146587 at -546; 595-96. According to this study,

b. Revenue-Sharing Agreements Inhibited the Threat of Competition from OEMs and Other Third-Party App Stores

190. Google's carrier revenue sharing agreements also helped to prevent OEMs and other third-party app stores from gaining a foothold in the Android ecosystem. As detailed in the prior section, [redacted]. This implies that an equally efficient rival that sought to compete with Google [redacted].

191. Carrier revenue sharing agreements also inhibited third-party App stores from competing by offering larger revenue shares to developers. Carriers in the United States controlled which App stores were preloaded on devices; without the support of a carrier, third-party App stores faced higher barriers to reaching consumers. [redacted]. An OEM or other third-party App store that attempted to attract developers to their store by offering less than a 30 percent take rate would have had less revenue available to offer to carriers. Record evidence indicates [redacted].[446]

2. Google's Exclusionary Restraints on OEMs

192. I understand that three contracts typically govern the relationship between Google and OEMs. First, OEMs enter Android Compatibility Commitments ("ACCs"), which replaced Anti-Fragmentation Agreements starting in 2017.[447] Broadly speaking, it is my understanding that AFAs and ACCs prevent OEMs from selling any "forked" Android-based devices that do not meet Google's compatibility standards. Provisions in a typical AFA read as follows:

[redacted]. *Id.* at -601. Nor have I seen evidence that wireless carriers would risk losing substantial mobile broadband revenue by forcing prospective customers to delete their popular third-party Apps before joining a new mobile broadband network.

444. GOOG-PLAY-001547487 at -488.

445. *Id.*

446. Morrill Dep. 123-124.

447. GOOG-PLAY-000458664.R ([redacted]); GOOG-PLAY-000422837 at -838 ([redacted] GOOG-PLAY-000127155 ([redacted] GOOG-PLAY-000808433 ([redacted]); GOOG-PLAY-000808062 ([redacted]); GOOG-PLAY-000808451 ([redacted]); GOOG-PLAY-003604523 ([redacted]); GOOG-PLAY-000416448 ([redacted]).

- [redacted].
- [redacted].
- [redacted].[448]

193. Record evidence indicates Google considers forks [redacted] because they could allow third parties to [redacted][449] OEMs must agree to an AFA (or now an ACC) in order to enter into MADAs, discussed in detail in the following subsection. Both are required to gain access to GMS, which has become critical for many Apps to function.[450] Finally, most OEMs enter into a Revenue Sharing Agreement—whereby Google shares revenue it earns on the device with the OEM.[451]

a. Google's Mobile Application Distribution Agreements Require Distribution and Prominent Placement of the Play Store

194. Google owns some of the most highly valued and widely used Android Apps, including Google Search, Play Store, Maps, Chrome, Gmail, and YouTube. Yet Google refuses to make these Apps individually available to OEMs for pre-installation, instead requiring OEMs to pre-install an entire GMS suite or forgo installation of *any* Google proprietary app.[452] It is all or nothing.[453] As explained in the Majority Report of the Congressional Subcommittee on Antitrust, Commercial and Administrative Law:

> Only through Google's licensing agreements can smartphone manufacturers access Google's proprietary Apps, such as Gmail, YouTube, Chrome, Google Maps, and Google Play Store. In return, Google requires that certain Apps must be pre-installed and must receive prominent placement on mobile devices.[454]

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448. GOOG-PLAY-000127155 ([redacted]).

449. GOOG-PLAY-001559464.R at -469.R.

450. I understand that Professor Schmidt's finds that GMS is necessary for many Apps properly function. *See also* GOOG-PLAY-001559464.R at -473.R [redacted]).

451. *See, e.g.,* GOOG-PLAY-002604372 ([redacted]).

452. [redacted] *See, e.g.,* GOOG-PLAY-000808375 at -377-378 ([redacted]); GOOG-PLAY-004552342 at -344 ([redacted]). [redacted] *Id.* at -344, -347 (§§ 1.15, 3.3). [redacted] *See, e.g.*, GOOG-PLAY-000620996 § 1.1 ([redacted]). *See also* Android GMS, *The best of Google, right on your devices*, www.android.com/gms/.

453. GOOG-PLAY-003776161.R at -177.R ([redacted]).

454. *Majority Staff Report* at 212. *See also* GOOG-PLAY-000400751.R at -773.R.

Google recognizes the importance of GMS: [redacted][455]

195. In addition, Google places a number of proprietary APIs in Google Mobile Services. I understand that Professor Schmidt finds that, without access to those APIs, a mobile device based on AOSP or a forked version of Android will lack access to many commercially important applications. In order to access these critical APIs so that applications can work, and to access certain highly demanded applications, OEMs must sign a MADA with Google to obtain the entire suite of GMS Apps.[456]

196. A typical MADA includes several clauses that require an OEM to give preference to Google Search and other applications in the GMS suite, including the Play Store. GMS Apps must be pre-loaded on devices and prominently displayed on the home screens. Google Search must be the default search engine and must also be given prominent placement.[457] The current MADA also requires OEMs to place the Play Store on the home screens of each mobile device.[458] If an OEM wishes to install just one App from the GMS suite, the MADA requires that the [redacted] also be installed, and the number of required Google Apps has increased over time.[459] Collectively, all of the Apps in the GMS suite occupy valuable space on each user's mobile device that otherwise could be occupied by competing App stores or other Apps. [redacted].[460] In sum, Google is able to leverage

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455. GOOG-PLAY-001559464.R at -471.R. Google recognizes that [redacted] *Id*. Licensing GMS, along with revenue shares, can be a [redacted]. *Id.*

456. GOOG-PLAY-001559464.R at -473.R; *see also* Rosenberg Dep. 189:24-191:1 ([redacted]).

457. *See, e.g.,* GOOG-PLAY-000025345 at -353—354. *See also* GOOG-PLAY-000400751.R at -773.R [redacted]

458. *See, e.g.*, GOOG-PLAY-004552342 at -347 ([redacted]); GOOG-PLAY-000808375 at -384 ([redacted]). [redacted]. GOOG-PLAY-000620996 at -1002 ([redacted]).

459. *See* GOOG-PLAY2-000001992 at -1995 [redacted]).

460. *See, e.g.* GOOG-PLAY-004552342 at -348 (§ 3.4) [redacted]); GOOG-PLAY-001404176 (noting that [redacted]

the dominant positions of the Apps in the GMS suite to impose restrictions that are designed to further establish and protect its market power in the Android App Distribution Market.[461]

197. Although Google's MADAs do not prevent OEMs from preloading alternatives to GMS,[462] Google exploits the Play Store's prominent status, which works to the detriment of rival App stores, including any pre-installed near Google's App store.[463] Google's documents recognize [redacted] [64] And in questioning whether users and developers would really choose the Play Store, given a choice, a high-level Google employee wrote, [redacted]

b. Google Has Deployed Multiple Measures in the OEM Channel to Ensure That Amazon Would Not Become an Effective Play Store Competitor

198. Google has taken multiple steps to stop competitors from succeeding with a competing App store. Amazon in particular was a potential competitor that has been substantially foreclosed by Google's conduct, which raised the costs to Amazon of competing with its rival App store. *First*, as discussed above, the MADAs mandate installation of the Play Store as a condition of installing any App in the GMS suite. In 2014, Amazon launched a bare Android device called the "Fire Phone," which was not pre-loaded with any of the GMS Apps. Indeed, users were "locked out" by Google from downloading these Apps. Unsurprisingly, consumer demand for a device that cannot include Apps like YouTube, Gmail, or Google Maps was low, and Amazon discontinued

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[redacted]

461. Google's documents establish that the MADA requirements are essential to the Play Store's dominance. GOOG-PLAY-006355073 [redacted] GOOG-PLAY-004494430.C at -433.C [redacted].

462. *See* GOOG-PLAY2-000001992 [redacted].

463. Samsung's Galaxy Store is an example of this. As discussed below in Part IV.A.2.c, while the Galaxy Store came pre-installed along with the Play Store on the Galaxy S10 and later models, Google has engaged in a course of conduct designed to discourage effective competition to the Play Store from Samsung. [redacted] *See* GOOG-PLAY-000443908 at -909. Economists recognize, and multiple studies have shown, that defaults can significantly affect consumer choice. *See* Brigitte C. Madrian & Dennis F. Shea, *The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior*, 116(4) QUARTERLY JOURNAL OF ECONOMICS 1149-1187 (2001); Zachary Brown, Nick Johnstone, Ivan Haščič, Laura Vong, and Francis Barascud, *Testing the effect of defaults on the thermostat settings of OECD employees*, 39 ENERGY ECONOMICS 128-134 (2013); John Peters, Jimikaye Beck, Jan Lande, Zhaoxing Pan, Michelle Cardel, Keith Ayoob, and James O. Hill, *Using Healthy Defaults in Walt Disney World Restaurants to Improve Nutritional Choices*, 1(1) JOURNAL OF THE ASSOCIATION FOR CONSUMER RESEARCH 92-103 (2016).

464. GOOG-PLAY-000832471.

465. GOOG-PLAY-000292207.R at -226.R. *See also Id.* at -213.R [redacted]; GOOG-PLAY-006355073.

the device within a year.[466] The MADAs prevented an OEM from customizing the Apps on mobile devices by precluding an alternative bundle comprised of a rival App store (including Amazon's App store) alongside Google's other popular (non-Play Store) Apps—that is, a rival App store would need to compete across every dimension of Google's App suite at once, effectively raising its costs. Without a successful "Fire Phone" due to Google's restrictions, Amazon was less likely to fully compete in the Android App Distribution Market by investing and developing a mobile App store that would rival the Play Store in scope and reach.[467]

199. *Second,* in 2015 Amazon released a backdoor to the Amazon Appstore (Amazon's App distribution store) through the Amazon App (Amazon's shopping App) that was available for download on the Play Store. As one media outlet noted, "The move effectively turns Amazon's flagship application—an App that has somewhere between 50 million and 100 million installs, according to Google Play's data for the smartphone version—into an App store App that directly competes with Google Play, while also being sold on Google Play." [468] [redacted][469]

200. *Third*, using its control over access to the GMS suite and the dominant position of the Play Store in the Android App Distribution Market, Google was able to introduce additional restraints that strongly discouraged use of bare Android devices. For example, consumers who had purchased an App via the Play Store were prohibited from re-downloading that App to a bare Android device that could not include the Play Store. These consumers would have to repurchase the same App on their bare device to keep using it.[470] Accordingly, consumers wishing to move to non-Google Android devices, such as the Amazon "Fire" phone, would be required to repurchase all Apps they had previously purchased from the Play Store or contact the developer directly to request a free download on the new device.

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466. Benjamin Edelman & Damien Geradin, *Android and competition law: exploring and assessing Google's practices in mobile*, 12(12-3) EUROPEAN COMPETITION JOURNAL 159, 167 (2016) [hereafter Edelman & Geradin].(citing Geoffrey Fowler, *Amazon Fire Phone Review: Full of Gimmicks, Lacking Basics*, WALL STREET JOURNAL (Jul. 23, 2014), wsj.com/articles/amazon-fire-phone-review-full-of-gimmicks-lacking-basics-1406077565).

467. *See* GOOG-PLAY-001317740 at -741 ([redacted]; GOOG-PLAY-001451619 ([redacted]); *see also* GOOG-PLAY-007657997 at -8010 ([redacted]).

468. GOOG-PLAY-000832219 at -221.

469. [redacted]. GOOG-PLAY-000832219 [redacted]).

470. Edelman & Geradin at 167 (citing Fowler, *Amazon Fire Phone Review*). The Nokia X phone, also launched in 2014, met a fate similar to the Amazon Fire Phone for these reasons. *Id.*

c. Google Discouraged Samsung from Effectively Competing with the Play Store in the Distribution of Apps in the Android App Distribution Market and Entered into Deals with Developers to Mitigate the Risk of Competition from Samsung

201. Google's treatment of Samsung, the largest Google Android OEM, illustrates Google's recognition of the potential competitive threat posed by a competing App store and the lengths Google would take to avoid such competition. [redacted]

202. As early as 2011, Google [redacted][474] Google's goal was: [redacted][476]

203. [redacted]"[480]

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471. GOOG-PLAY-000004762.R at -764.R; *see also* GOOG-PLAY-000367346.R.
472. GOOG-PLAY-006359924 at -925 (explaining [redacted]).
473. GOOG-PLAY-006359924.
474. *Id.* at -925.
475. GOOG-PLAY-001438299 at -300. *See also* GOOG-PLAY-004253884 at -907 [redacted]).
476. GOOG-PLAY-001449339 at -340 (explaining [redacted]).
477. GOOG-PLAY-000417080.
478. GOOG-PLAY-001455849 (explaining [redacted]).
479. *Id.*
480. GOOG-PLAY-001847447 at -448 ([redacted]).

204. [redacted][486]

205. Google's [redacted][487].

206. [redacted]

- [redacted][489]
- [redacted],"[490]

207. [redacted]

481. GOOG-PLAY-004509271 at -272.
482. *Id.*
483. *Id.*
484. GOOG-PLAY-000004762.R at -4785.R. *See also* GOOG-PLAY-000367346.
485. The technical processes known as [redacted] was a critical part of Google's offering. As described by Google, [redacted] meant that Google provided the [redacted] GOOG-PLAY-000464148 at -150. It would also [redacted] *Id.* In practical terms, that meant Google [redacted]. *Id.* at -149—150.
486. GOOG-PLAY-000367346.R at -347.R.
487. Rosenberg Dep. 114:24-115:22 ([redacted]).
488. *Id. See also* GOOG-PLAY-007384816 at -818 ([redacted]).
489. GOOG-PLAY-001877016.C at -020.C—021.C.
490. *Id.* at -020.C.

[redacted]"[491]

e. Google's New Revenue Sharing Agreements With OEMs Are Designed To Further Entrench the Play Store's Monopoly

208. Google has further insulated the Play Store from competition through its most recent series of OEM agreements. Stylized as [redacted] these agreements [redacted].[492]

209. I understand that Google [redacted]

210. [redacted].[497] In 2020, based on projections for 14 OEMs

491. *Id.*

492. *See* GOOG-PLAY-004489416.R; GOOG-PLAY-000443763; GOOG-PLAY-004494430.C; GOOG-PLAY-004486928.R.

493. GOOG-PLAY-000443763.R at -773.R..

494. *Id.* at -775.R.

495. GOOG-PLAY4-007239946; *see also* GOOG-PLAY-001555373 [redacted]

496. *Id. See also* GOOG-PLAY-001555373 [redacted]

497. GOOG-PLAY-000620210 ([redacted] GOOG-PLAY-000620638 ([redacted] GOOG-PLAY-005706338 ([redacted] GOOG-PLAY-008111867 ([redacted]; GOOG-PLAY-001745614 ([redacted] GOOG-PLAY-000416708 ([redacted] GOOG-PLAY-000620282 [redacted]); GOOG-PLAY-000620442 ([redacted]); GOOG-PLAY-000620131 ([redacted]); GOOG-PLAY-005706436 ([redacted] GOOG-PLAY-005706676 ([redacted]); GOOG-PLAY-007038477 ([redacted]); GOOG-PLAY-007038511 ([redacted]); GOOG-PLAY-000620478 ([redacted]); GOOG-PLAY-005706728 ([redacted] GOOG-PLAY-000416651 ([redacted]

who had then signed [redacted] agreements, Google anticipated over [redacted].[498] According to Google's internal estimates, as of [redacted] and this was expected [redacted].[499] For some OEMs, all or nearly all of their devices sold [redacted] demonstrating the power of Google's revenue sharing terms.[500]

211. The RSA agreements substantially foreclose some of the remaining and most viable distribution avenues for competitive App stores. Indeed, as early as 2014, [redacted].[501] The RSA agreements also foreclosed competition from OEM app stores. For these agreements, Google [redacted].[502] Google planned to "[redacted]."[504] As of 2019, Google's plan was to [redacted].[505] Google's internal documents indicate that [redacted].[506] These new, broad restrictions on potential third-party competitors serve to further entrench the Play Store's dominance.[507]

212. Because Google's exclusionary restraints on OEMs eliminated the threat of vigorous OEM-based competition in the Android App Distribution market, I conclude that this element of the Challenged Conduct was anticompetitive.

3. Google's Exclusionary Android App Distribution Market Conduct and Restraints with Respect to App Developers

a. Google's Developer Distribution Agreements and App Campaigns Program Are Exclusionary

213. Google's agreements with developers inhibit competition from rivals in the Android App Distribution Market by prohibiting the distribution of competing App stores through the Play Store and by prohibiting developers from steering users to lower-priced App distribution channels or using user information learned through the Play Store. Developers are precluded from using the Play Store "to distribute or make available any Product that has a purpose that facilitates

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498. GOOG-PLAY-008006134.
499. GOOG-PLAY-003894142.R at -172.R. I understand that Plaintiffs do not have updated discovery from Google to determine the number of current devices that ship under [redacted].
500. *Id.* at -173.R. ([redacted]).
501. GOOG-PLAY-000449614 at -615.
502. GOOG-PLAY-000443763.R at -774.R.
503. *Id.*.
504. *Id.* at -775.R.
505. GOOG-PLAY4-007239946 at -947.
506. GOOG-PLAY-004502766.
507. GOOG-PLAY-001555373 ([redacted]. . .").

the distribution of software applications and games for use on Android devices outside of Google Play."[508] Nor can developers steer consumers to other platforms or websites to purchase or download Apps or In-App Content: "You may not use user information obtained via Google Play to sell or distribute Products outside of Google Play."[509]

214. In addition, to access Google's App Campaigns program, Android App developers must list their Apps in the Play Store.[510] Only Apps that were distributed in the Play Store could participate in Google's App Campaign program, a program specifically designed to allow developers to place ads for Apps and In-App Content on Google's self-proclaimed most valuable properties.[511] Those "properties," which are specially optimized for the advertising of mobile Apps, included Google Search, YouTube, Discover on Google Search, and the Google Display Network. Google was explicit about this linkage in its marketing, representing that placement in the Play Store enabled developers to "get your App into the hands of more paying users" by "streamlin[ing] the process for you, making it easy to promote your Apps across Google's largest properties."[512] This conduct further entrenched Google's monopoly in the Android App Distribution Market by coercing developers to list their Apps in the Play Store or risk losing advertising access to some of the Internet's most effective advertising space.

b. Google's Project Hug Agreements Are Anticompetitive

215. Google also introduced "Project Bear Hug," later shortened to "Project Hug," which imposed a contractual requirement on major Play Store developers to prevent App stores from entering "exclusives for the most lucrative and risky developers."[513] Project Hug was a key

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508. *See* Google Play Developer Distribution Agreement (as of Jan. 4, 2014) ("You may not use the Market to distribute or make available any Product whose primary purpose is to facilitate the distribution of software applications and games for use on Android devices outside of the Market."); Google Play Developer Distribution Agreement (as of Sep. 25, 2014) ("You may not use the Store to distribute or make available any Product which has a purpose that facilitates the distribution of software applications and games for use on Android devices outside of the Store."); Google Play Developer Distribution Agreement (effective as of June 12, 2020) ("You may not use Google Play to distribute or make available any Product that has a purpose that facilitates the distribution of software applications and games for use on Android devices outside of Google Play."). For years, dating at least back to 2008, Google called this the [redacted]. *See, e.g.*, GOOG-PLAY-000054021 at -022; GOOG-PLAY-000054683 at -685 ([redacted]). By 2014, Google had dropped this label in favor of calling the provision [redacted] Compare GOOG-PLAY-000054039 at -041 (2014 version) with GOOG-PLAY-000053975 at -977 (2017 version).

509. GOOG-PLAY-000053875 at -876 (Google Play Developer Distribution Agreement (effective as of Nov. 17, 2020), point 4.9).

510. Google Ads Help, *About App campaigns,* support.google.com/google-ads/answer/6247380?hl=en.

511. *See* GOOG-PLAY-000226999 at -6999—7001 ([redacted]").

512. Google Ads Help, *About App campaigns,* support.google.com/google-ads/answer/6247380?hl=en.

513. *Id.* at -019.C.

element of Google's effort to prevent developers from supporting a rival App store.[514] Like Google's payments to OEMs and mobile operators, Project Hug followed a simple formula: pay the potential competitor enough to prevent it from going "off-Play" or from giving a competitor such as Samsung exclusive content, but less than Google's expected loss from damage to its monopoly.[515]

216. As detailed below, Project Hug is shown to be anticompetitive through the economic lens of an MFN imposed by a dominant firm. When employed by dominant platforms such as Google, MFNs have been recognized as impairing competition.[516] Project Hug is also anticompetitive when viewed through the economic lens a dominant firm that makes payments to induce would-be horizontal rivals not to compete against it. Economists recognize that harm to competition occurs when a monopolist or dominant firm pays rivals not to compete. Such payments effectively share monopoly profits with actual or prospective rivals as an inducement to prevent competition from breaking out.[517] Economists recognize that "paying competitors to stay out of the market may be profitable, but doing so reduces competition and is likely to attract very close antitrust scrutiny."[518]

217. Known internally as the [redacted] requirement, Project Hug required developers to [redacted].[519] Google's documents indicate that [redacted]

514. GOOG-PLAY-000445443.R at -458.R. Externally, in negotiations with developers, Google referred to Project Hug as the "Games Velocity Program" ("GVP"). *See* GOOG-PLAY-000932349. Google required [redacted].

515. Another important component of Project Hug was [redacted]. GOOG-PLAY-000000807. [redacted] *Id.* at -808. In support of this endeavor, Google would offer [redacted] *Id.* at -809. In return, [redacted] *Id.* at -810—811. This project later became known as [redacted] and is discussed in Part IV.A.2.c above.

516. *See, e.g.*, Jonathan B. Baker & Fiona Scott Morton, *Antitrust Enforcement Against Platform MFNs*, 127(7) YALE LAW JOURNAL 2176-2202, 2177 (2017) (studying the effects of MFNs under an "agency distribution model," whereby "the platform does not take ownership of the good (*e.g.*, the hotel room) but sells it on behalf of the owner at a price chosen by the owner").

517. *See, e.g.,* Carl Shapiro, *Antitrust Limits to Patent Settlements*, 34(2) RAND JOURNAL OF ECONOMICS (2003), 394. ("A hallmark of these anticompetitive agreements is that the patentholder agrees to share its monopoly profits with the challenger in order to induce the challenger to give up its fight.") *Id.* at 393 ("Precisely because patent settlements can be anticompetitive, and because settling parties may have an incentive to insert anticompetitive provisions into their agreements, antitrust interest in the settlements of intellectual property disputes is very high.")

518. Jeremy Bulow, *The Gaming of Pharmaceutical Patents*, *in* INNOVATION POLICY AND THE ECONOMY, 145, 159-73 (Adam B. Jaffe et al. eds., 2004) at 146. *See also* Steven Salop, "Potential Competition and Antitrust Analysis: Monopoly Profits Exceed Duopoly Profits," *Georgetown Law Faculty Publications and Other Works* No. 2380 (2021), https://scholarship.law.georgetown.edu/facpub/2380

519. GOOG-PLAY-000000807 at -810. *See also* GOOG-PLAY-011269238 at -344-345 ([redacted]).

[redacted]”[521]

218. Project Hug also imposed [redacted] provisions on certain developers, specifying that developers [redacted] For example, one Google document states, [redacted][522] Such provisions preclude steering to alternative platforms based on a lower price (or a lower quality-adjusted price).

219. In 2019-2020, Google learned of potential emerging App distribution competition from [redacted].[526] Record evidence indicates that Google [redacted]. Record evidence indicates that [redacted]. Specifically, Google [redacted]

520. GOOG-PLAY-000464148 at -151.
521. *Id.*
522. GOOG-PLAY-007755618.
523. GOOG-PLAY-004702858 ([redacted]); *see also* AB-GOOG-000492 ([redacted]); Koh Tr. 200:4-16 [redacted]).
524. GOOG-PLAY-007424789 ([redacted] *See also* Koh Tr. 200:4-16 [redacted]).
525. GOOG-PLAY-007424518 at -522 ([redacted]).
526. GOOG-PLAY-007421525 ([redacted]); *see also* Koh Tr. 278:24-279:2 [redacted]
527. GOOG-PLAY-007424789.
528. GOOG-PLAY-004702858. [redacted]”).
529. GOOG-PLAY-007424789; *see also* Koh Tr. 286:14-24 [redacted]”).

[530] None of these entities have entered the Android App Distribution market.

220. One of the key Google employees responsible for implementing has explained that .[533] In this way, Project Hug impaired competition from other stores.

221. At the same time, in June 2019, a Google executive referred to noting, [34]

222. While Google on in July 2019 and instructed its employees to [535]. In 2019, Google executives [37] This result stemmed from the ”[538]

530. GOOG-PLAY-004696168.R at -174.R. The deal ” *Id.* at -170.R. Google was *Id.* at -169.R, -176.R. To mitigate this Google *Id.* at -169.R.

531. Koh Dep. 362:18-363:1.

532. *Id*. at 364:13-365:4.

533. *Id*. at 366:25-367:16.

534. GOOG-PLAY-002994573 at -574.

535. GOOG-PLAY-004136427.

536. GOOG-PLAY-000443908.R at -911.R.

537. *Id.* at -909.R. The same document presents . *Id.* at -913.R ( ).

538. GOOG-PLAY-000367346.R at -351.R.

223. Google's subsequent analysis of a major game release, [redacted].[539] Thus, Google's pressure and its Project Hug agreements thwarted [redacted] efforts to differentiate its product offerings through [redacted]. Otherwise, more developers and consumers would have been attracted to the [redacted]. Google was able to achieve this result [redacted].

224. Project Hug provided incentives in the form of [redacted].[540] The benefits were significant, typically amounting to around [redacted].[541] In return for these payments, Google required that developers invest in the Play Store [redacted].[542]

225. Google's Project Hug and the [redacted] requirement in particular proved successful. Within one year, [redacted].[544] According to Google, [redacted]

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539. GOOG-PLAY-000001317. In a 2019 internal email referencing [redacted] Google's [redacted] asked, [redacted] In response, Google's [redacted] reported that [redacted]. *Id.* at 318. Similarly, "[redacted]." *Id.* More broadly, the same document also estimated that [redacted]. *Id.* at 317 ([redacted]").

540. *See, e.g.,* GOOG-PLAY-000559379.R at -382.R and -384.R; GOOG-PLAY-000000807; GOOG-PLAY-000229696; GOOG-PLAY-005027813 (showing [redacted]). Through providing such incentives, Google could gain a foothold through [redacted]. *See* GOOG-PLAY-011269238 at -251, [redacted]

541. GOOG-PLAY-000559379.R at -382.R—383.R ("[redacted]"). *See also* GOOG-PLAY-004119228.R at -237.R ("[redacted]").

542. GOOG-PLAY-000000807 at -810-811.

543. GOOG-PLAY-000001976.

544. *Id.* ("[redacted].").

[redacted][545] Google, aiming to [redacted].[546] By April 2020, Google had [redacted][547] Shortly thereafter, [redacted].[548]

226. [redacted][551]

227. Google's [redacted] requirement that [redacted] can be understood as a most-favored-nations ("MFN") clause foreclosing competing App stores from entering into exclusive arrangements with developers whereby, in return for a substantial payment, the developers agree to launch a title exclusively on a rival App store. As noted above, when employed by dominant platforms such as Google, MFNs have been recognized as impairing competition.[552] In this case, Google's monopoly power allowed it to enter into contracts precluding developers from offering high-quality exclusive content to rival app stores that might have been used by the app stores to attract a sufficiently large user base and compete more vigorously with the Play Store.[553] In a more competitive environment, developers would have had economic incentives to promote competition in the Android App Distribution market by offering high-quality exclusive content to rival app stores.

228. Pricing-parity MFNs preclude the supplier (developer) from pricing below the price it charges on the platform,[554] but MFNs can also dictate non-price terms such as product quality or timing that indirectly weaken price competition. Baker and Scott Morton explain that "[p]latform MFNs with greater scope and duration would be expected to have stronger anticompetitive effects and impose larger penalties[.]"[555] The scope of Google's equivalent to an

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545. GOOG-PLAY-000003283.R at GOOG-PLAY-000003308.R.
546. GOOG-PLAY-000001976 at GOOG-PLAY-000001976-GOOG-PLAY-000001977 ("[redacted]").
547. GOOG-PLAY-000003283.R at GOOG-PLAY-000003286.R.
548. GOOG-PLAY-003899355.R at GOOG-PLAY-003899360.R.
549. GOOG-PLAY-004146689.R at GOOG-PLAY-004146697.R.
550. *Id.*
551. *Id.* at -722.R.
552. *See, e.g.*, Baker & Morton, *supra.*
553. GOOG-PLAY-000929031 at 032-033.
554. A pricing-parity requirement creates an incentive for the seller not to offer low prices because any price discount must be offered to all covered buyers, which makes discounting more expensive and thus softens price competition. Baker & Morton, *Antitrust Enforcement Against Platform MFNs*, *supra*, at 2179-2180.
555. *Id*. at 2182.

MFN here can be measured by the share of the Play Store's revenue generated by participating Apps among U.S. customers. Using Google's transaction data, I estimate that [redacted]. I also estimate that [redacted]. Put differently, [redacted].

229. [redacted].[559]

230. [redacted].

c. Google May Have Secured An Agreement To Eliminate Potential Competition from [redacted]

231. As detailed below, I understand that Google may have secured a [redacted] not to deploy a competing App store by leveraging the threat of technically disrupting [redacted]. I am not opining on the existence of such an agreement. If the fact finder determines that Google and [redacted] did reach such an agreement, it likely would have generated anticompetitive effects.

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556. List taken from GOOG-PLAY-000237798. [redacted] is excluded from this list. GOOG-PLAY-000001976 [redacted]

557. The [redacted] developer list was taken from GOOG-PLAY-000237798, with [redacted] excluded, *supra*. The expanded [redacted] r list is taken from GOOG-PLAY-004146689.R at -710.R.

558. Koh Dep. 364:9-365:4.

559. *Id*. at 366:2-367:16.

560. Google [redacted]. GOOG-PLAY-011269238 at -260 ([redacted]). *See also id*. at -271-276 ([redacted].

232. [redacted].[567]

233. Google documents and testimony [redacted]

561. GOOG-PLAY-007339480.R at -481.R ("[redacted].").

562. *See* Bankhead Dep. 119:7-10 ("[redacted].").

563. *Id. See also* GOOG-PLAY-003688820.

564. GOOG-PLAY-008216048 ([redacted]").

565. GOOG-PLAY-000333091; GOOG-PLAY-007339480.R at -494.R ([redacted]).

566. GOOG-PLAY-004452685 at -685.

567. GOOG-PLAY-000333220 at -221. Record evidence indicates that, [redacted]. GOOG-PLAY-004698100.R at -102.R

568. GOOG-PLAY-004698100.R at -105.R ("[redacted]; Rasanen Dep. 110:17-23 ("[redacted].").

569. GOOG-PLAY-000840536.

570. *Id*.

[redacted][572]

234. I understand that Google continued to seek and obtain [redacted] commitment not to compete in subsequent years. According to testimony from Google witnesses and record documents, in [redacted] Google [redacted].[573]

235. Record evidence indicates that [redacted] offered [redacted] a technology known as [redacted] to [redacted].”[575] Record evidence indicates that Google initially sought

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571. Kochikar Dep. 406:24-407:18 (“[redacted].”).

572. [redacted]_000015003 at -004 [redacted]”). *See also* GOOG-PLAY-005428116 ([redacted]); [redacted] Dep. 212:8-20 ([redacted]); Lagerling Dep. 100:3-16 ([redacted]); Lockheimer Dep. 393:4-12 ([redacted]).

573. Kochikar Deb. 425:18-22 (“[redacted]); GOOG-PLAY-005428116 ([redacted]).

574. GOOG-PLAY-007379918.

575. Rasanen Dep. 169:22-170:3.

to [redacted][76][redacted][577]

236. Google documents and testimony indicate that [redacted]. In August 2016 email, [redacted][578][redacted][581]

237. Record evidence suggests that [redacted].[582] [redacted].[583] Deposition testimony indicates that [redacted]

576. GOOG-PLAY-009734977 at -978 [redacted]).

577. GOOG-PLAY-000083999 [redacted]); GOOG-PLAY-006367390 ([redacted]); Rasanen Dep. 204:9-16 [redacted]).

578. GOOG-PLAY-007379918.

579. *Id.*; *see also* Bankhead Dep. 415:7-9 ([redacted]").

580. GOOG-PLAY-007379918.

581. *Id.*

582. *See* GOOG-PLAY-009734977 at -979 ("[redacted]").

583. Rasanen Dep. 151:12-152:3 [redacted]").

[redacted].[584]

238. For the reasons given above, I conclude that Google's exclusionary Android App Distribution Market Restraints on App Developers were anticompetitive. In a more competitive but-for world, Google would have eliminated these anticompetitive restraints, and the Play Store would have competed on the merits with lower-priced App distribution channels.

4. Technical Barriers

239. I understand that Professor Schmidt finds that Google has imposed technical barriers that make it unnecessarily difficult for consumers to download Apps from rival App stores. I understand that Professor Schmidt explains that, in many cases, users must first locate the store on the Internet, then sideload the store, and then change a security setting on Android devices, which Google discourages by first creating default settings that block these downloads, and then, if the user attempts to change the setting to download an application, by displaying often misleading warnings regarding competing App stores.

240. For example, [redacted].[585] The "Unknown Sources" label is ominous, with early versions warning users that downloading App stores would make your "[p]hone and personal data … more vulnerable to attack."[586] Google has used variations of this warning even for reputable stores like Amazon's.[587] I understand that Google has continued to use such warnings when a user attempts to install rival App stores.[588]

241. Google further frustrates the ability of consumers to customize their devices by imposing technical barriers that impact the downloading of Apps from outside the Google Play Store, including from developer websites. While Google Android technically permits sideloading, I understand that Professor Schmidt opines that Google has made it unnecessarily cumbersome by requiring sideloading to proceed through the "unknown sources" flow. I also understand that Google, over time, has increased the frequency with which a user encounters the "unknown sources" flow. In the past, a user would trigger the "unknown sources" flow when downloading a

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584. Karam Rough Dep. Tr. 179:16-180:1 [redacted]).

585. A Google presentation [redacted]. GOOG-PLAY-000297309.R at -311.R-314.R. I understand that this is confirmed by Professor Schmidt.

586. Blake Stimac, *How to sideload an App onto your Android phone or tablet*, GREENBOT (July 17, 2014), greenbot.com/article/2452614/how-to-sideload-an-app-onto-your-android-phone-or-tablet html.

587. Jimmy Westenberg, *How to install the Amazon Appstore on your Android [Android 201]*, ANDROIDGUYS (Apr. 5, 2014), androidguys.com/tips-tools/install-amazon-app-store-android/.

588. According to one Google document, [redacted]. *See* GOOG-PLAY-004904016.R at -4032.R. According to the same document, [redacted]. *Id.* (showing, e.g., [redacted]).

third-party App store, but not when thereafter downloading an App from that third-party App store. Now, a user triggers the "unknown sources" flow when downloading the third-party App store *and* when downloading the user's first app. As a result of these technical impediments, sideloading is not a commercially viable alternative distribution channel for most developers.[589]

242. In addition, I understand that Professor Schmidt will explain that Google has also historically restricted auto-updating capability for Apps not listed in the Play Store or App stores pre-installed by OEMs. (Auto-updating is properly understood as a function in the Android App Distribution Market; there is no separate demand among consumers for that function apart from an App store.) This restriction inhibits competition by degrading the user experience for Apps downloaded from an alternative source. I understand that Professor Schmidt will set forth that Google only recently loosened this restriction when it released Google Android version 12 in October 2021.[590]

243. For the reasons given above, I conclude that Google's unnecessary technical barriers to competitors in the Android App Distribution Market were anticompetitive. In a more competitive but-for world, Google could have eliminated any unnecessary technical barriers, and the Play Store would have competed on the merits.

B. Google's Anticompetitive All-Or-Nothing Bundling of the GMS Suite

244. Google's dominance in the Android App Distribution Market flows in part from its power in the licensed mobile device operating systems market. Indeed, the Android App Distribution Market could be characterized as an aftermarket to the market for licensed mobile device operating systems. Google's documents illustrate how Google's power in the market for licensed mobile device operating systems helps to ensure the Play Store's dominance. A 2019 presentation reviewing the Play Store's business model displays [redacted].

589. *See also* Jerry Hildenbrand, *Sideloading and Unknown Sources on Android: How to do it and fix errors*, ANDROID CENTRAL, (Apr. 16, 2020), www.androidcentral.com/unknown-sources ; Edelman & Geradin , *supra*, at 168 ("enabling sideloading requires first reducing phone security settings, which users will rightly hesitate to do."); Joel Snyder, *What are the risks of sideloaded Android applications?*, SAMSUNG KNOX, (Apr. 20, 2020), www.samsungknox.com/en/blog/what-are-the-risks-of-sideloaded-android-applications ; Dallas Thomas, *Get Easy Updates on Sideloaded Android Apps*, GADGET HACKS, (Dec. 27, 2016), android.gadgethacks.com/how-to/get-easy-updates-sideloaded-android-Apps-0174291/.

590. *See also* Google Play services, developer.android.com/distribute/play-services ; GOOG-PLAY-004904016.R.

591. GOOG-PLAY-000443763 at -768.

FIGURE 14: INTERNAL GOOGLE VIEW ON LINKAGE BETWEEN THE PLAY STORE'S DOMINANCE AND ANDROID'S DOMINANCE

Source: GOOG-PLAY-000443763.R at -768.R.

The presentation recognizes that [redacted]"[592] in other words, [redacted].

245. Google's all-or-nothing bundling of the GMS suite gave it a large competitive advantage as developers were inclined to offer Apps on a platform that was guaranteed to also carry the high-value GMS Apps.[593] [redacted].[594]

246. Google's all-or-nothing bundling of the GMS suite can be shown to be anticompetitive using standard antitrust methods. A bundled offer can be considered exclusionary provided that an equally efficient competitor in the competitive ("tied") market cannot earn a profit while compensating a buyer for any discounts on the monopolized ("tying") product that the buyer would have to forgo in order to avoid the bundle. This is sometimes referred to as the "discount attribution test," or the *Cascade* test.[595] Applied to this case, the tied product is the Play Store, and

592. *Id*. at GOOG-PLAY-000443769.
593. Edelman & Geradin at 162-164.
594. Jim Kolotouros Dep. 110:13-111:14. [redacted]. *Id.* at 125:14-17.
595. *See, e.g.,* Patrick Greenlee, David Reitman, & David Sibley, *An antitrust analysis of bundled loyalty discounts* 26(5) INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION 1132-1152 (2008); see also Einer Elhauge,

the tying product consists of the high-value GMS Apps that are bundled with the Play Store. If an OEM refuses to install the Play Store on its devices, then it cannot obtain the high-value GMS Apps at any price. Put differently, the "penalty price" of purchasing the tying product outside of the bundle is infinite. It follows immediately that there is no amount of money that a competing App store could offer an OEM that would provide sufficient compensation for the OEM to purchase the high-value GMS Apps on a standalone basis. Therefore, Google's all-or-nothing bundling of the GMS suite is anticompetitive according to the discount-attribution test.

C. Google Has Substantially Foreclosed Competition in the Android App Distribution Market

247. A dominant firm can maintain and extend its monopoly power through strategies that foreclose critical inputs from the competition.[596] This can involve making critical inputs more expensive or even unattainable, as well as restricting the quantity or quality of critical inputs available to rivals. In the Android App Distribution Market, Google has foreclosed competition by has restricting rivals' ability to preload their stores, as explained in Part II.C.1 above. Google has also restricted rivals' access to prominent placement for their App stores, as explained in Part IV.A.2 above. Google has also imposed technical barriers restricting alternative distribution methods for rival App stores and developer websites, as explained in Part IV.A.4 above. In summary, the Challenged Conduct has permitted Google to substantially foreclose competition by denying its rivals access to critical inputs necessary to compete effectively in the Android App distribution market.

248. A dominant firm can also maintain and bolster its monopoly power by paying rivals not to compete with it.[597] As explained in Part IV.A.1 above, Google did exactly that through its revenue-sharing agreements with carriers, which inhibited competition not just from the carriers themselves, but also from OEMs and third-party app stores.

249. In addition to foreclosing competition in the In-App Aftermarket, the Aftermarket Tie-In served to reinforce foreclosure in the Android App Distribution Market. Record evidence [redacted]"[598] Economists recognize the importance of this "two-stage entry" in digital markets.[599] The Aftermarket Tie-In foreclosed this pathway to increased competition.

Tying, Bundled Discounts and the Death of Single Monopoly Profit Theory, 123(2) HARVARD LAW REV. 397-481 (2009).

596. *See, e.g.,* Steven Salop, *The Raising Rivals' Cost Foreclosure Paradigm, Conditional Pricing Practices, and the Flawed Incremental Price-Cost Test* 81(2) ANTITRUST LAW JOURNAL 371 (2017). *See also* Kevin Caves, Chris Holt, & Hal Singer, *Vertical Integration in Multichannel Television Markets: A Study of Regional Sports Networks* 12(1) REVIEW OF NETWORK ECONOMICS 61 (2013).

597. *See, e.g.,* Steven Salop, *The Raising Rivals' Cost Foreclosure Paradigm, Conditional Pricing Practices, and the Flawed Incremental Price-Cost Test* 81(2) ANTITRUST LAW JOURNAL 371, 379 (2017).

598. GOOG-PLAY-006829073.R at -153.R.

599. Michael Katz & Carl Shapiro, *Antitrust in Software Markets,* in JEFFREY EISENACH & THOMAS LENARD, EDS. COMPETITION, INNOVATION, AND THE MICROSOFT MONOPOLY: ANTITRUST IN THE DIGITAL MARKETPLACE 29, 70-71 (Springer Dordrecht 1999).

FIGURE 15: THE IN-APP AFTERMARKET TIE ALSO FORECLOSED COMPETITION IN THE ANDROID APP DISTRIBUTION MARKET

Source: GOOG-PLAY-006829073.R at -153.R.

V. GOOGLE'S ANTICOMPETITIVE CONDUCT IN THE IN-APP AFTERMARKET

250. In this Part, I demonstrate that Google has engaged in anticompetitive conduct to extend and retain its power in the In-App Aftermarket. For the reasons given below, I conclude that the Aftermarket Restrictions function as an anticompetitive tie-in of Google's Android App Distribution Market services to the In-App Aftermarket. In a more competitive but-for world, Google would have refrained from tying, and would have competed on the merits with rivals in the In-App Aftermarket.

A. Google's Anticompetitive Exclusionary Conduct in the In-App Aftermarket

251. Google has maintained multiple restrictions affecting the In-App Aftermarket. These fall into three mutually reinforcing categories. By contract, Google conditions the right to distribute an App downloaded through the Play Store on a developer's agreement to exclusively use Google Play Billing for all subsequent sales of In-App Content.[600] Google contractually requires developers to pay Google a set take rate (generally at 30 percent) for every purchase of In-App Content made through their Apps in perpetuity.[601] Put differently, Google enforces this condition by requiring the developer to use Google Play Billing for all payments of In-App Content

600. Google – Play Console Help, *Developer Program Policy* (effective December 1, 2021), support.google.com/googleplay/android-developer/answer/11498144?hl=en&visit_id=637814760589469507-2803788482&rd=1. https://support.google.com/googleplay/android-developer/answer/11365487?hl=en. *See also* my discussion earlier in Part III.C.

601. Record evidence indicates that [redacted]. Paul Feng Dep. 329:13-331:18 (discussing GOOG-PLAY-000571076.R).

within the App forever and at the same take rate it commands in the Android App Distribution Market.[602] If a consumer downloads an App via the Play Store, the developer is charged a commission for any purchases made within the App, even long after the Play Store performed its initial matchmaking and distribution function. Thus, Google has extended its monopoly power in the Android App Distribution Market to insert itself into the separate In-App Aftermarket by requiring developers to exclusively use Google Play Billing for authorization and payment services in support of the purchase of In-App Content and to pay Google a take rate on those purchases (usually 30 percent), which can economically be characterized as a "tie-in."

252. Google also contractually prohibits developers from steering customers to alternative authorization and payment processing outlets for purchasing In-App Content outside the Play Store, including the developer's web site or alternative suppliers of payment processing and other services in the In-App Aftermarket.[603] And Google even prohibits the developer from using any consumer information learned through the Play Store. These restraints constrain an App's steering to lower-cost alternatives via browser-based payment options such as "in-App web views, buttons, links, messaging, advertisements, or other calls to action."[604]

253. In contrast, other App stores allow developers the ability to select their providers of payment systems for purchases of In-App Content at lower take rates than Google imposes. For example, Aptoide imposes a ten percent take rate for purchases of In-App Content if the user downloads the App using the developer's own URL.[605] The One Store in South Korea imposes a five percent commission for developers that do not use the One Store billing system.[606]

1. Google's Contractual Provisions with Developers Enable Google To Maintain Its Dominance in the In-App Aftermarket

254. In other settings, the long-term or perpetual arrangements that Google has imposed on developers might have been difficult to enforce. That is not the case here. By requiring developers to use Google Play Billing in support of the purchase of all In-App Content, Google can readily monitor and enforce its take rates, enabling extraction of a supra-competitive commission for as long as the App is used and In-App Content is purchased.

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602. *See* Google - Play Console Help, *Service fees*, support.google.com/googleplay/android-developer/answer/112622?hl=en. The service fee applies if developers sell subscriptions or other digital content within an app, but is not affected by the length of time after an App is downloaded – with the exception of subscription products, which face a lower service fee after being retained for over a year.

603. Play Console Help – Policy Center, *Payments*, ¶4 support.google.com/googleplay/android-developer/answer/9858738?visit_id=637998221375662867-914435124&rd=1. *See also* GOOG-PLAY-000225435 [redacted]).

604. Play Console Help – Policy Center, *Payments*, ¶4 support.google.com/googleplay/android-developer/answer/9858738?visit_id=637998221375662867-914435124&rd=1.

605. Catappult, Revenue share, docs.catappult.io/docs/distribution-and-revenue-share ("Self-distribution opens the possibility for the developer to promote and distribute their Apps through their own channels and earn a revenue share of 90%").

606. GOOG-PLAY-000005203 at -5221, -5264. *See also* Kim Byung-wook, *Google's App billing plan continues to backfire*, THE KOREA HERALD (June 28, 2021), koreaherald.com/view.php?ud=20210628000824 ("Unlike Google, ONE store allows App developers to operate their own billing systems. In this case, the cut is 5 percent.").

255. Only about three percent of the developers that sold In-App Content in the In-App Aftermarket through Apps initially downloaded from the Play Store in 2020 were able to circumvent the restriction, although Google later announced that it was going to enforce the restriction on this group.[607] Those few developers able to circumvent Google's restrictions have a critical mass of consumers and widespread name recognition, which has enabled them to allow users to purchase their In-App Content from other platforms. The most prominent developers in this category are Netflix, Amazon, Spotify, and Match Group.[608] A company like Netflix, a household name with over 200 million subscribers, does not want to hand over to Google 30 percent of first-year subscriber revenue simply because a consumer created her account on her Android App. Circumventors like Netflix were able to steer users to their websites, where consumers could create a new account not subject to Google Play Billing.[609] Developers engaging in this steering had to do so indirectly—through communications outside the App—because Google's agreements with developers preclude them from explicitly steering users to the developer's website for digital content purchases.[610] The vast majority of developers do not possess the requisite widespread user adoption, name recognition, and clout to circumvent Google's restriction.

2. Google's Revenue-Sharing Agreements with Developers Have Substantially Eliminated the Threat of Defection to Alternatives in the In-App Aftermarket

256. Google has taken steps to rein in any developers whom it perceived might threaten to use alternative authorization and billing systems in the In-App Aftermarket to avoid Google's take rate.

257. [redacted]

607. Samat , *Listening to Developer Feedback to Improve Google Play*, *supra.*

608. EPIC_GOOGLE_00123016; EPIC_GOOGLE_01389946. Google still holds significant power over these companies. For instance, Match Group's chief legal officer, Jared Sine, in testimony before the United States Senate detailed communications from Google inquiring into why his testimony might differ from what they had already discussed. "When you receive something like that, Senator, from a company that can turn you off overnight, you're always a little intimidated," said Sine. He added, "We're all afraid, is the reality, Senator." Angel Au-Yeung, *App Providers Are 'All Afraid' Of Apple's And Google's Market Power, Match Group And Spotify Tell Senate*, FORBES (Apr. 21, 2021), forbes.com/sites/angelauyeung/2021/04/21/app-providers-are-all-afraid-of-apples-and-googles-market-power-match-group-and-spotify-tell-senate/?sh=4a622ae9596c. *See also* GOOG-PLAY-000559379.R at -382.R [redacted]").

609. Tinder also accomplished steering by means of differential pricing—offering significantly lower prices for its subscription services when users signed up through its website. EPIC_GOOGLE_02075797 ("[redacted]").

610. When Epic explicitly steered consumers to their own payment system rather than Google's system by providing a 20% discount, Google removed Epic's Fortnite from the Play Store. *See* Jack Nicas, *How Apple's 30% App Store Cut Became a Boon and a Headache*, NEW YORK TIMES (Aug. 14, 2020), nytimes.com/2020/08/14/technology/apple-app-store-epic-games-fortnite.html. Google states that developers are allowed to use other platforms in addition to Google Play, but that they cannot directly advertise alternative options through their App. *See* Google - Play Console Help, *Understanding Google Play's Payments policy*, support.google.com/googleplay/android-developer/answer/10281818?hl=en#zippy=%2Ccan-i-distribute-my-app-via-other-android-app-stores-or-through-my-website%2Ccan-i-communicate-with-my-users-about-alternative-ways-to-pay%2Ccan-i-communicate-with-my-users-about-promotions-on-other-platforms.

[redacted].”[611] Google chose these developers because [redacted].”[612] Indeed, Google estimated that defection by these developers could cost Google “~[redacted][613] Google estimated [redacted].[614] [redacted].

258. Depositions to date have [redacted][615]

259. [redacted][617]

B. Google Substantially Foreclosed Competition in the In-App Aftermarket

1. Google’s Aftermarket Tie-In Substantially Foreclosed Competition In the In-App Aftermarket

260. The Aftermarket Tie-In has substantially foreclosed competition in the In-App Aftermarket. Before Google offered In-App Aftermarket services, other companies provided these services for Android apps. In June 2010, a mobile payments startup called Boku announced it would be offering developers the capability “to monetize any Android app with in-app purchases via carrier billing.”[618] PayPal introduced a “library for Android developers to use to integrate

611. *See* GOOG-PLAY-000559379.R at -382.R [redacted]). *See also* Koh Dep. 153:10-19 ([redacted]) (testifying about PX. 136 – GOOG-PLAY-003332817.R at -822.R).
612. GOOG-PLAY-000233314
613. GOOG-PLAY-000000807
614. *See* GOOG-PLAY-000004762.R at -764.R.
615. Koh Dep. at 368:4-369:4.
616. GOOG-PLAY-004144047.R at -052.R ([redacted]).
617. GOOG-PLAY-003881390.R.
618. Leena Rao, *Mobile Payments Startup Boku Launches In-App Billing Library For Android*, TECH CRUNCH (June 2, 2010), techcrunch.com/2010/06/02/mobile-payments-startup-boku-launches-in-app-billing-library-for-android/

Paypal payments into their app" in May 2010.[619] When Google began to offer In-App Aftermarket services, Google employees discussed [redacted]."[620] [redacted].[621]

261. The Aftermarket Tie-In substantially foreclosed these would-be rivals from competing in the In-App Aftermarket. In September 2020, Google reported that only about three percent of developers in the Play Store had used payment processors other than Google Play Billing in the prior year.[622] Google's enforcement of the In-App Aftermarket Tie-In requires developers to use only Google Play Billing for all purchases of In-App Content. Developers are prevented from using their own methods of authorization and payment processing services or contracting for them through third parties. Alternative providers are therefore foreclosed from the In-App Aftermarket. Google's documents indicate that [redacted].[623]

262. Record evidence indicates that [redacted]."[624] Record evidence also indicates that Google recognizes that, [redacted]. One Google presentation explains that [redacted]."[625]

263. Although fringe rivals such as Samsung and Amazon participate in the In-App Aftermarket today, their market shares are minimal, as shown in Part III.C.2.a above. The existence of these fringe competitors does not negate Google's substantial foreclosure of the In-App Aftermarket. Developers that distribute their Apps through the Play Store cannot turn to fringe rivals such as Samsung and Amazon as competitive alternatives in the In-App Aftermarket.

264. The ability of a small number of large developers such as Netflix and Spotify to circumvent the Aftermarket Tie-In by using their own payments systems does not negate Google's

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619. Greg Kumparak, *PayPal launches In-App Payment library for Android*, TECH CRUNCH (May 19, 2010), techcrunch.com/2010/05/19/paypal-launches-in-app-payment-library-for-android/.

620. GOOG-PLAY-004320094.

621. *Id.* ("[redacted]." *Id.*

622. *See* Samat, *Listening to Developer Feedback to Improve Google Play*, *supra* ("Less than 3% of developers with apps on Play sold digital goods over the last 12 months, and of this 3%, the vast majority (nearly 97%) already use Google Play's billing.").

623. GOOG-PLAY-006829073.R at -159.R.

624. GOOG-PLAY-009911010 at -011.

625. GOOG-PLAY-000565541.R at -560.R.

substantial foreclosure of the In-App Aftermarket. The vast majority of developers in the Play Store cannot avail themselves of this option and are obliged to comply with the In-App Aftermarket Tie-In. In addition, because developers such as Netflix and Spotify use their own vertically integrated payment solutions, they do not provide an opportunity for third-party rivals to compete in the In-App Aftermarket.

2. Google's Aftermarket Tie-In Foreclosed Competition From Online Stores

265. Google has also used the Aftermarket Tie-In to foreclose online stores offering In-App Content, an alternative distribution channel that could have threatened Google's dominance in the In-App Aftermarket. In 2015, popular Apps such as LINE and Kakao, were enabling users to make In-App purchases of virtual currency and other digital goods through online stores.[626] These online stores offered users the ability to pay with multiple forms of payment, some of which could not be used with Google Play Billing, including PayPal, prepaid internet café cards, and gift cards.[627] To incentivize consumers to utilize this alternative distribution channel, developers offered discounts on In-App Content purchased through online stores.[628] For example, LINE offered web store buyers [redacted] more content for the same price,[629] as well as [redacted] in bonus credit for customers utilizing the company's own payments system ("LINE Pay)."[630]

266. Google characterized this alternative distribution channel as [redacted]"[631] In a slide titled [redacted]"[632] Google estimated that it could lose between [redacted][633] Separately, Google estimated that [redacted].[634] Google took steps to eliminate the risk web stores posed to Play's business. According to Google's documents, [redacted]"[635]

626. GOOG-PLAY-000447326.R at -369.R.
627. GOOG-PLAY-002410316.R at -333.R; *see also* GOOG-PLAY-011097069 [redacted]").
628. GOOG-PLAY-002410316.R at -338.R ([redacted]").
629. *Id.* at -339.R.
630. GOOG-PLAY-011097069 at -082.
631. GOOG-PLAY-007280720 at -720.
632. GOOG-PLAY-002410316.R at -340.R.
633. *Id.* at -341.R.
634. GOOG-PLAY-011097069 at -071. Google described the impact on consumer spend through Play as [redacted] *Id.*
635. GOOG-PLAY-011097069 at -075-76.

267. Although it is unclear which of these particular measures were undertaken with specific developers, according to Google's documents, it [redacted].[636] According to Google's documents, [redacted].[637] Record evidence indicates [redacted].[638] [redacted].[643]

268. Google's enforcement of its In-App Aftermarket Tie restricted consumer access to payment alternatives and limited consumer choice. According to Google documents, [redacted].[644] For example, [redacted].[645] In addition, the availability of in-game currencies and items in online stores enabled users to purchase digital goods in a single location, and to use them across different devices. By preventing steering and the embedding of these alternative payment methods in-app, Google restricted users' ability to access better prices and forms of payment.[646]

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636. GOOG-PLAY-000890941 at -943; *see also* GOOG-PLAY-011097069 at -075 [redacted]).

637. GOOG-PLAY-002410316.R at -321.R.

638. *Id.*

639. GOOG-PLAY-000871962 at -962-963 ([redacted]).

640. GOOG-PLAY-011097069 at -080 [redacted]).

641. *Id.* at -081 [redacted]

642. *Id.*

643. *Id.*

644. [redacted] GOOG-PLAY-006753434.

645. GOOG-PLAY-011097069 at -081.

646. Google documents indicate that [redacted]. *See* GOOG-PLAY-002410316.R at -347.R.

269. Record evidence indicates that the economic effects of Google's efforts to foreclose online stores were substantial. Google estimated that [redacted][647]

C. Google Cannot Claim That Its Supracompetitive Profits Are Constrained by the "Single Monopoly Profit" Theory

270. Economists recognize that tying allows firms to extract more consumer surplus than they could otherwise, and can be anticompetitive when practiced by firms with market power.[648] In the 1970s and 1980s, economists belonging to the "Chicago School" of economics—which promotes the virtues of free-market principles[649]—condoned many exclusionary strategies with an economic theory that has become known as the "single monopoly profit" ("SMP") theory. The SMP theory posits that, since a monopolist will always find a way to fully exploit its monopoly profit in the market it has monopolized, regardless of the existence of a secondary market or aftermarket, any exclusionary conduct in the secondary market is motivated by procompetitive reasons, such as vertical integration efficiencies, and should not be condemned as anticompetitive.[650]

271. Applied to this case, Google may erroneously argue that the SMP theory could be interpreted to deem Google's Aftermarket Restrictions procompetitive and lacking in harm to competition or consumers. It would posit that, if Google were prohibited from engaging in the Challenged Conduct, Google would merely raise its take rate in the Android App Distribution Market or impose some other fees to fully restore the profits it now extracts from the In-App Aftermarket. SMP theory suggests that, so long as Google had a monopoly in the Android App Distribution Market, it would find a way to fully extract a monopoly profit from that market, such that there would be no incentive to further monopolize the In-App Aftermarket. In this section, I explain how two of the key assumptions that undergird the SMP theory are not satisfied, meaning that the profits Google has extracted from the In-App Aftermarket were not available to Google solely on the basis of its monopoly in the Android App Distribution Market. Accordingly, Google's anticompetitive conduct in the In-App Aftermarket was motivated to extract incremental supra-competitive monopoly profit from developers.

272. A wave of new economic research in the 1990s and 2000s has shown that the implications of the SMP theory hold only if certain assumptions that underlie it also are true.[651] As it is applied to artificially linking a monopolized service—here, Android App distribution—with

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647. GOOG-PLAY-007348629.R at -640.R.

648. *See, e.g.,* Michael Whinston, *Tying, Foreclosure, and Exclusion* 80(4) AMERICAN ECONOMIC REVIEW 837-859 (1990); Ilya Segal & Michael Whinston, *Naked Exclusion: Comment* 90(1) AMERICAN ECONOMIC REVIEW 296-309 (2000); Einer Elhauge, *Tying, Bundled Discounts and the Death of Single Monopoly Profit Theory*, 123(2) HARVARD LAW REV. 397-481 (2009); JEFFERY CHURCH & ROGER WARE, INDUSTRIAL ORGANIZATION: A STRATEGIC APPROACH, 159 (McGraw-Hill 2000).

649. Akhilesh Ganti, *Chicago School of Economics*, INVESTOPEDIA (Feb. 21, 2021), www.investopedia.com/terms/c/chicago_school.asp.

650. *See, e.g.*, Robert Bork, THE ANTITRUST PARADOX: A POLICY AT WAR WITH ITSELF (Bork Publishing 2021); Aaron Director & Edward H. Levi, *Law and the Future Trade Regulation,* 51 NW. U. L. REV. 281 (1956).

651. For a review of the economic literature, see Einer Elhauge, *Tying, Bundled Discounts and the Death of Single Monopoly Profit Theory*, 123(2) HARVARD LAW REV. 397-481 (2009).

a product or service in another market—here, services in support of the purchase of In-App Content—the five conditions under which the SMP theory holds are:

(1) buyers do not use varying amounts of the linked product or service (in the In-App Aftermarket);

(2) buyers exhibit a strong positive correlation in their demands for the linked product or service (in the In-App Aftermarket) and the linking products or services (in the Android App Distribution Market);

(3) buyers do not use varying amounts of the linking product or service (Android App distribution);

(4) the competitiveness of the linked market (the In-App Aftermarket) is fixed; and

(5) the competitiveness of the linking market (the Android App Distribution Market) is fixed.[652]

273. When any one of these assumptions is not supported empirically, then the pro-competitive justifications of SMP theory do not hold.[653] Here, assumptions (1) and (4) are not satisfied. Failure to satisfy either one would undermine application of SMP theory. Failure to satisfy both assumptions strengthens that conclusion. Because SMP theory does not apply here, Google is using its Aftermarket Restrictions to extract profits it otherwise would not be able to obtain. The inapplicability of SMP theory implies an anticompetitive motivation for Google's Aftermarket Restrictions.

274. Google's take rate in the In-App Aftermarket is tethered to the spending on In-App Content by the consumer. The demand for the services in support of consummating the purchase of In-App Content is derived from the demand for the In-App Content itself. Applied to this case, for Google to extract consumer surplus solely by virtue of its market power in the Android App Distribution Market, assumption (1) requires that consumers do not purchase varying amounts of In-App Content. This is plainly false. Different consumers purchase different quantities of In-App Content, and therefore Google's revenues through its take rate anticompetitively applied to those purchases vary by consumer. [redacted]. Figures 16, 17, and 18 show the distributions of purchases of In-App Content for three of the top-selling games.

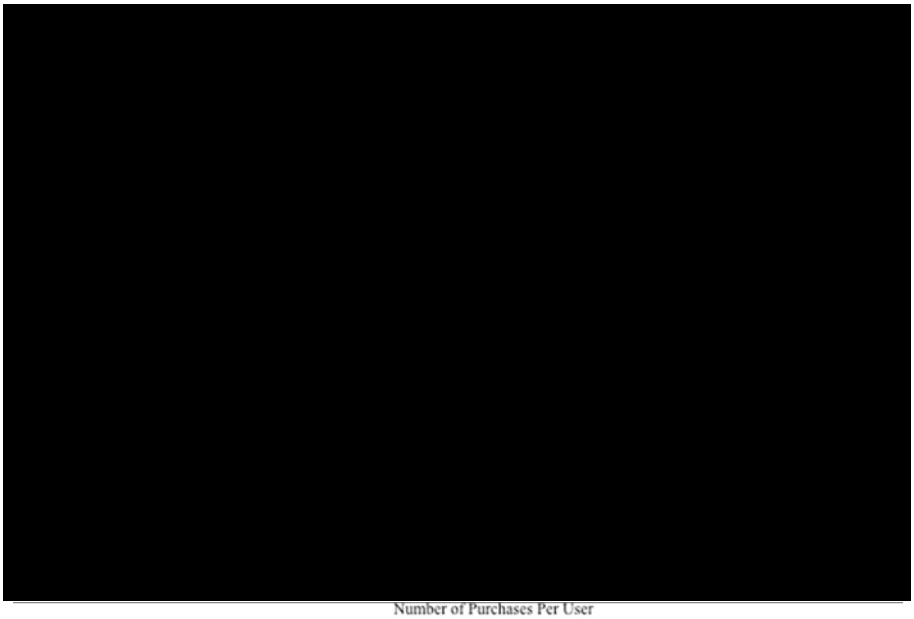
652. *Id*. at 404 [redacted] (emphasis added).

653. *Id*. For example, when assumption (1) is violated and consumers use varying amounts of the linked product or service, tying can be used to extract consumer surplus, with buyers who use more of the tied product effectively paying more for the same product. Discriminating with ties may be more effective than traditional price discrimination—that is, charging a different price to each buyer—if the firm could not otherwise tell how much buyers value the tying product.

FIGURE 16: IN-APP PURCHASES PER USER [redacted]

FIGURE 17: IN-APP PURCHASES PER USER [redacted]

FIGURE 18: IN-APP PURCHASES PER USER [redacted]



275. As the figures demonstrate, the consumers' purchases of In-App Content vary widely across buyers, proving that assumption (1) is violated. The varying amounts of purchases of In-App Content provides an anticompetitive motivation for Google's extension of its monopoly power in the Android App Distribution Market into the In-App Aftermarket to extract more revenue from its monopoly position—an opportunity that would not exist in the absence of the Aftermarket Restrictions.

276. Google may argue that it inserted itself into the In-App Aftermarket via the restraint requiring developers to use Google Play Billing for all transactions so as to monitor and "meter" both a customer's usage and a developer's sales of In-App Content for an App. However, as a matter of economics, Google cannot extract the same level of monopoly profits through this restriction as it would solely through a monopoly in the Android App Distribution Market. Given the wide range of purchases of In-App Content, it would be very difficult for Google to predict, *ex ante*, a given consumer's propensity to make particular purchases of In-App Content. Such a prediction would be needed by Google to replicate a metering strategy with upfront pricing for Apps sold solely in the Android App Distribution Market through the Play Store.[654] The problem

654. A "metering tie" occurs whenever a firm meters usage of its product by requiring users to purchase at elevated prices a tied product that is needed to use its product, as in the case of printers and ink. Economists have shown that, contrary to the Chicago School, metering ties are often used for anticompetitive purposes. *See, e.g.*, Einer Elhauge & Barry Nalebuff, *The Welfare Effects of Metering Ties*, 33 JOURNAL OF LAW, ECONOMICS & ORGANIZATION 68 (2017) (showing that metering ties (1) *always* lower consumer welfare and total welfare unless they increase capital good output, and (2) *always* harm consumer welfare, even when output increases, under realistic market conditions in which usage rates are independently distributed from per-usage valuations). Applied here, there is no credible theory under which Google's restrictions increased output in the Android App Distribution Market. Indeed, to the extent a foreclosed rival in the In-App Aftermarket could have evolved into a competitive App store, Google's restrictions could have reduced output in the Android App Distribution Market as well. *See, e.g.*, GOOG-PLAY-004564758 [redacted]).

for Google is that it is impossible to know *ex ante* how much any given consumer/developer combination will use an App and subsequently generate any purchases of In-App Content so as to be able to price Apps to generate a supra-competitive monopoly profit for Google.

277. In addition to assumption (1) being violated, assumption (4) requires that the "competitiveness" of the In-App Aftermarket be "fixed"—that is, the tied market is perfectly competitive in a way that tying cannot alter. Applied here, that would mean that In-App Aftermarket rivals (such as independent payment processors or developers) face no entry or fixed costs and can expand instantaneously to supply the whole market.[655] If true, then the extent of competition in the In-App Aftermarket would be invariant to Google's tie-in, in the sense that Google's inserting its payment processing service into the In-App Aftermarket cannot be used to reduce the competitiveness or efficiency of rivals or potential rivals in the In-App Aftermarket.[656] This assumption is not true, however, because Google's contractual linkage is specifically designed to prohibit developers from using any alternative to Google Play Billing to provide In-App Aftermarket services. In the absence of the requirement, there would be myriad third-party providers of In-App Aftermarket services (such as payment processing, authorizing the use of In-App Content, record keeping, and server hosting) for developers, which would engender competition on take rates.

278. Moreover, the infrastructure to provide payment processing (and authorization) exhibits economies of scale;[657] the same payment system (or record-keeping system or server) can be used for each additional transaction. Depriving third-party competitors in the In-App Aftermarket of scale economies makes them weaker competitors and alters the state of competitiveness in the In-App Aftermarket. Google's tie-in can foreclose enough of the tied market to make entry revenues, spread across a lower base of transactions, lower than entry costs. Just as a monopoly resort that requires guests to eat all meals on the property (a tie-in) can foreclose independent local restaurants and prevent them from achieving the requisite economies of scale,[658] so too has Google foreclosed rival suppliers in the In-App Aftermarket, resulting in the ability for Google to charge supra-competitive take rates on purchases of In-App Content. In an open, competitive In-App Aftermarket, developers would be free to choose an alternative payment processor, and take rates in the In-App Aftermarket would fall towards competitive levels. In the

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655. Einer Elhauge, *Tying, Bundled Discounts, and the Death of the Single Monopoly Profit Theory*, 123(2) HARVARD LAW REVIEW 397-481, 413 (2009).

656. *Id.* ("the economic literature summarized below shows that a tie that forecloses enough of the tied market can reduce rival competitiveness by impairing rival efficiency, entry, existence, aggressiveness, or expandability.").

657. *See, e.g.*, Oxera, *Paying up: the new economics of payment systems* (Jun. 30, 2020), www.oxera.com/insights/agenda/articles/paying-up-the-new-economics-of-payment-systems/ ("Retail payments have long been characterised by the following three economic features …. economies of scale—which mean that it can be more efficient to operate a platform with a large number of users (although regulatory and technical developments are tending to reduce the importance of this)."); Risto Gogoski, *Payment systems in economy - present end future tendencies*, 44 PROCEDIA - SOCIAL AND BEHAVIORAL SCIENCES 436–445, 438 (2012) ("The payment industry also exhibits considerable economies of scale. First, the value that an individual participant derives from using a particular payment system increases with the number of other parties using that same system. Second, high levels of initial investment (called 'sunk costs') are required in order to establish a payment system, and considerable fixed costs are incurred in the operation of such a system (more payments less costs).").

658. This example comes from Dennis Carlton, *A General Analysis of Exclusionary Conduct and Refusal to Deal—Why* Aspen *and* Kodak *Are Misguided*, 68(3) ANTITRUST LAW JOURNAL 659-983 (2001).

next section, I offer two models that can be used to estimate those reduced take rates in the Android App Distribution Market and in the In-App Aftermarket, respectively.

VI. THE CHALLENGED CONDUCT GENERATED ANTITRUST IMPACT

279. A key difference in the two relevant antitrust markets—the Android App Distribution Market being two-sided and the In-App Aftermarket being one-sided—allows for different methods for assessing impact or what take rates and consumer subsidies would prevail in each market without Google's Challenged Conduct. I discuss these two methods and their implications in turn. In Part VI.B, using a two-sided model developed by Rochet and Tirole, where the locus of competition is on the developer take rate, I show classwide impact for those members of the Damages Class in the Android App Distribution Market. In Part VI.C., using a one-sided model of price competition, I show classwide impact for members of the Damages Class in the In-App Aftermarket. In Part VI.E, again using the two-sided model developed by Rochet and Tirole, where the locus of competition is instead on the consumer subsidy, I show classwide impact for members of the Damages Class. In Part VII, I estimate aggregated damages to U.S. Consumers nationwide based on these impact models. In Part VIII, I describe a methodology for computing individual U.S. Consumers' damages.

280. My analysis differs from the standard regression analysis commonly used in many price-fixing matters to isolate the effects of anticompetitive conduct in a limited timeframe compared to a competitive market absent the challenged restraints. Because Google has imposed the Challenged Conduct in both the Android App Distribution Market and the In-App Aftermarket since those markets were originally formed, there is no pre-existing or post-conduct time period to use for purposes of standard regression analysis. Accordingly, I employ widely accepted economic models to determine take rates that would be charged in a hypothetical but-for world without the Challenged Conduct. Before introducing the models, I briefly explain how multi-homing (by customers and developers) and steering (by developers) would put downward pressure on take rates in the absence of the Challenged Conduct.

A. Multi-Homing and Steering Would Put Downward Pressure on the Take Rate That Google Imposes on App Developers

281. Google's Challenged Conduct has enabled Google to charge developers supra-competitive take rates in the Android App Distribution Market and the In-App Aftermarket. With its dominance in the Android App Distribution Market and consequent market power in the In-App Aftermarket, Google is able to extract a supra-competitive take rate on all paid App downloads and purchases of In-App Content. This is true even after Google's reduction in its take rates announced in March 2021 (from 30 percent to 15 percent on the first $1 million of developer revenue)[659] and for subscription payments after the first year as of January 1, 2018 (reduced to 15

659. Sameer Samat (Google Vice President, Product Management), *Boosting Developer Success on Google Play*, ANDROID DEVELOPERS BLOG (Mar. 16, 2021), android-developers.googleblog.com/2021/03/boosting-dev-success html ("Starting on July 1, 2021 we are reducing the service fee Google Play receives when a developer sells digital goods or services to 15% for the first $1M (USD) of revenue every developer earns each year.") Although the new policy applied to all developers, the overall reduction in the take rate is less significant for larger developers, because it applied only to the first $1 million in revenue. For example, developer with $10 million in revenue would pay a 15 percent take rate on the first $1 million, and a 30 percent take rate on the remaining $9 million, which works out to an overall take rate of 28.5 percent.

percent).[660] The concepts of multi-homing and steering are critical to understanding how Google's contractual restraints with OEMs, developers, and mobile carriers work as an economic matter.

1. Multi-Homing

282. Multi-homing, as the name suggests, occurs whenever buyers or sellers on the opposite sides of a two-sided platform use more than one platform for the same or similar purpose. For example, many young Internet users have social media accounts on two or more social media platforms (e.g., Facebook and TikTok). Many ride-sharing drivers and riders have both Uber and Lyft on their phone, another form of multi-homing. Multi-homing is not exclusive to the digital world: People carry two or more credit cards in their wallets, and the stores they frequent accept more than one card, although anti-steering rules imposed by one of the most popular credit cards may inhibit card competition.[661]

283. In the context of this case, multi-homing exists to the extent consumers have App stores side-by-side on their mobile phone's home screens (if Google's conduct did not prevent consumers from having multiple App stores)—the adjacent placement is necessary so that multi-homing is equally convenient for consumers. When two platforms are sufficiently close substitutes in the eyes of buyers and sellers, multi-homing can lead to competitive outcomes that benefit both buyers and sellers.[662]

284. Multi-homing would occur absent the Challenged Conduct, as developers would be willing to distribute their applications through alternative App stores if they could achieve sufficient reach by doing so. And consumers would be willing to install the second App store on their home screens if (1) they could access their favorite Apps on a rival App store, and (2) if at least some of those Apps were available at a lower price on the second App store—a phenomenon that, in a competitive world absent Google's restrictions, would be made possible via steering.[663]

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660. Although Google decreased the take rate for subscription services from 30 percent to 15 percent in 2018, the decrease was only applicable after the first year. (It wasn't until January 1, 2022, that the take rate was reduced to 15 percent for all subscription services across the board). Google documents indicate that [redacted]. *See* GOOG-PLAY-007819776 at -909. Moreover, Google estimates in the lead-up to the announcement found [redacted]. *See* GOOG-PLAY-000446626.R at -629.R. Another Google analysis calculated [redacted]. *See* GOOG-PLAY-001291233 at -251. In contrast, the competitive but-for world is one in which all developers would have enjoyed substantial and permanent reductions in the take rate and would be characterized by long-run equilibrium price adjustments to substantially lower developer costs flowing from substantially lower take rates. As a consequence, Google's reduction in the take rate for subscriptions is unlikely to provide an adequate natural experiment that could be used to accurately measure the extent to which consumers would have paid lower prices in the but-for world.

661. Even if there is multi-homing, restrictions can create less than a competitive outcome. *See, e.g.,* Kevin Caves & Hal Singer, *Competing Approaches to Antitrust: An Application in the Payment Card Industry*, 27(3) GEORGE MASON LAW REVIEW 823-861 (2020).

662. Susan Athey & Fiona Scott Morton, *Platform Annexation*, Stanford Inst. for Econ. Policy Research Working Paper 21-015 (March 2021).

663. Although my primary impact model focuses on price effects (over the take rate), it is possible that competition would occur on non-price quality dimensions as well. For example, a specialized App store could emerge that provided better discoverability features, forcing Google to compete on that dimension.

2. Steering

285. Steering can exist in any type of market, but in the context of the two-sided platform present in this case, steering would entail a developer charging differential prices to consumers based on which platform the consumer selects, from which to download an App. The developer's aim, if steering were allowed, would be to induce consumers to transact over a lower-cost platform.[664] Economists have shown that, in a platform setting, steering puts downward pressure on the prices charged by sellers (here, developers), and thus anti-steering restraints are almost certainly harmful to competition.[665] Indeed, [redacted].[666] One Google document [redacted],"[667]

286. Steering occurs regularly across platforms in other industries where there are no restrictions that prevent it. One example is the market for "daily deals"—or discounted prices on certain products or services on a specific day—offered by platform Apps like Groupon and Living Social. Empirical research has shown that in markets where there is platform competition, sellers on the sites offer more valuable promotions to buyers at lower prices relative to markets without platform competition.[668]

287. With multi-homing and steering—both conditions are necessary for competition to drive down prices to consumers—developers could, and would be incentivized to, charge a lower price for Apps to consumers who download Apps from a lower-cost App store platform. Consider a scenario in which a developer faced two take rates: Google's 30 percent rate and a rival App store's 15 percent rate. For simplicity, assume the developer charges $1 for downloading the App. In a world with multi-homing, the developer would have strong incentives to steer its customers to the lower-cost platform, as doing so would save it $0.15 per download (equal to the product of

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664. *See, e.g.,* Rochet & Tirole at n. 3 ("The occurrence of steering is easiest to visualize in those illustrations in which platforms charge per-end-user-transaction fees: The seller of a house or a B2B supplier may only list the house or the wares on the cheapest platform.").

665. *See, e.g.,* Benjamin Edelman & Julian Wright, *Price Coherence and Excessive Intermediation,* 130 Q. J. ECON. 1283 (2015); Rong Ding, *Merchant Internalization Revisited,* 125 ECON. LETTERS 347 (2014); Rong Ding & Julian Wright, *Payment Card Interchange Fees and Price Discrimination*, 65 J. IND. ORG. 39 (2017). For an overview of the intersection of multi-homing and steering, see Erik Hovenkamp, *Platform Antitrust*, 44 JOURNAL OF CORP. LAW 713 at 18-19 (2019) ("A second type of steering is undertaken by sellers on one side of a transaction platform. In most situations where buyers and sellers both multi-home, the buyer ultimately chooses the platform used to mediate his transactions. … Alternatively, the seller may vary the prices it charges in transactions over different platforms, applying a surcharge to those it disfavors (or, equivalently, a discount for transactions on its preferred platform). Such steering efforts were forestalled by the restraint at issue in *AmEx*, which is discussed further below.").

666. GOOG-PLAY-006829073.R at GOOG-PLAY-006829085.R.

667. GOOG-PLAY-007755618 at 5619 [redacted]"). *See also* GOOG-PLAY-011269238 at -287 ([redacted]).

668. Kim et al., *Two-sided platform competition with multihoming agents: An empirical study on the daily deals market*, 41 INFORMATION ECON. AND POLICY 36-53 (2017).

the 15 percent differential in take rates and $1). Indeed, the developer would be willing to offer up to a $0.15 reduction in the price of the App to steer its customers to the lower-cost platform. As more customers shift their downloads to the rival platform, Google would be forced to revisit its take rate; a lower Google take rate would in turn induce developers to lower their prices on the Play Store. I model this competitive dynamic formally in the following sections.

B. A Two-Sided Platform Model with Multi-Homing Shows That Google Would Be Compelled to Lower Its Take Rate from Developers in the Absence of Google's Android App Distribution Market Restraints

288. I start by analyzing the impact of the Challenged Conduct in the Android App Distribution Market. For this purpose, I use a model based on the one developed by economists Jean-Charles Rochet and Jean Tirole (winner of the Nobel prize in economics for, among other things, his pioneering work on monopolized industries) who formalized the economic framework for two-sided markets.[669] This framework has been widely cited by other economists.[670]

289. The model shows by how much Google's take rate on paid initial App downloads in the Android App Distribution Market would fall if the locus of competition occurs on the developer side of the platform once Google's multiple restraints and technical barriers are removed. The model shows what Google would charge developers in the presence of multi-homing and steering, which would occur in the absence of Google's exclusionary restraints. Although Google's exclusionary conduct was aimed at myriad potential entrants—including mobile carriers, OEMs, and developers—my analysis of a potential but-for world requires entry by only one viable rival App store platform. Although Google has consistently charged a take rate at (or very close to) 30 percent [redacted],[671] my analysis also takes account of Google's current take rates. For example, the take rate has been lowered from 30 to 15 percent for (1) subscription App renewals beginning January 1, 2018, and (2) transactions made for Apps and In-App purchases for a developer's first $1 million in annual sales beginning July 1, 2021.[672] I discuss the basic intuition behind this model and show how it can be readily adapted to the current setting.

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669. Rochet & Tirole, *supra*.

670. *See, e.g.*, Avi Goldfarb and Catherine Tucker, *Digital Economics*, 57 JOURNAL OF ECONOMIC LITERATURE 3-43 (2019); Joseph Farrell & Paul Klemperer, *Coordination and lock-in: Competition with switching costs and network effects,* in MARK ARMSTRONG AND ROBERT PORTER EDS., 3 HANDBOOK OF INDUSTRIAL ORGANIZATION (Elsevier 2007).

671. *See, e.g.*, Table 8, *infra*, Row 3 (showing that Google collected service fees in excess of [redacted] of consumer expenditures from 8/16/2016 – 5/31/2022).

672. The relatively few developers who paid reduced take rates in the actual world would also have paid take rates below the but-for level. Google's anticompetitive conduct resulted in a substantially inflated headline take rate of 30 percent, which is economically equivalent to inflating the list price of a product in an antitrust context. Customers that receive discounts from an inflated list price still incur antitrust injury because the discounts they receive are tied to the list price. *See, e.g.,* Hal Singer and Robert Kulick, *Class Certification In Antitrust Cases: An Economic Framework,* GEORGE MASON LAW REVIEW 1046, 1049 (2010) (explaining that U.S. Consumers are impacted even when they receive discounts relative to an inflated list price; here the list price is Google's headline take rate of 30 percent). Thus, even developers who paid reduced take rates in the actual world would have also paid lower take rates in the but-for world, and would have passed on some of the resulting savings to consumers. In Part VIII, I demonstrate how damages can be calculated for individual U.S. Consumers using common methods, taking into account the fact that a limited number of developers received discounts relative to Google's standard 30 percent take rate.

290. In the event that the factfinder concludes that the Android App Distribution Market and In-App Aftermarket are not two separate markets, I have performed alternative analyses which apply the two-sided market framework to a single, combined market. These analyses (presented Part VI.H and Appendix 4) contemplate competitive scenarios in which platforms compete for all transactions (both initial downloads and in-App purchases) in the aggregate. In Part VI.E, I present a model in which the locus of competition occurs on the consumer side.[673] In Appendix 4, I present a model in which the locus of competition occurs on the developer side of the platform, and a model in which competition occurs on both the developer and consumer sides of the platform.

1. The Platform Model in a Monopolized Setting

291. The two sides of the Android App Distribution Market are consumers of initial paid App downloads (buyers) and App developers (sellers). Google sets the commission it has charged developers for using the Play Store. Google does not charge consumers for accessing the Play Store and instead offers a small subsidy in the form of its loyalty points program, Google Play Points, effectively implying a small *negative* price (or subsidy) for consumers using the Play Store.[674] Importantly, while Google sets the commission charged to developers, developers set their own prices on App downloads.[675] As my extension of the Rochet-Tirole model illustrates, developers that can offer their Apps on an App store that charges a lower commission than Google will be incentivized to "steer" consumers to the alternative App store by charging lower prices on downloads in that alternative App store than they charge in the Play Store. In this way, consumers would also benefit from competition between App stores.

292. I first outline the classic two-sided market model in which a platform operator sets per-transaction platform prices on both sides of the market where the platform operator has a monopoly (the "foundational monopoly model"). I then demonstrate how this model is easily extended to the instant case, where Google sets a take rate or commission imposed directly on developers instead of a per-transaction price and provides a subsidy to consumers in the form of loyalty points (the "applied monopoly model"). A portion of the supracompetitive cost imposed on developers through the take rate is passed through to consumers (which I show in Section VI.D below). I then describe the foundational and applied models in a setting where there is platform competition.

a. The Foundational Monopoly Platform Model

293. The Rochet-Tirole model was developed in a situation in which the operator of the two-sided platform has a monopoly and sets per-unit prices on both sides of the market to sellers and buyers.

294. In the instant case, Google controls the substantial majority of all App downloads on Android-compatible mobile devices and can thus appropriately be thought of as a platform

673. The model presented in Part VI.E can also be applied if there are two relevant markets.

674. The subsidy referenced here is paid by Google to the consumer. The consumer still pays a positive price to the developer—albeit a lower one due to the subsidy.

675. Google limits prices to between $0.05 and $400.00 on the Google Play Store. Google - Play Console Help, *Supported locations for distributions to Google Play users,* support.google.com/googleplay/android-developer/answer/10532353?visit_id=637777015722462270-3131223409&rd=1.

monopolist. As a platform operator, Google has the ability to charge both buyers and sellers for using the Play Store.

295. Google's charge to consumers (buyers) can be thought of as Google's ability to charge for transactions, which I denote as P_B. As is typical for many two-sided markets, Google sets the consumer access price (in this case, a subsidy) near zero.[676] As for developers (sellers), Google charges a take rate, or percentage of sales, of up to 30 percent. The foundational model uses a per-unit transaction price on the seller side, which I denote as P_S, instead of a percentage take rate. In the foundational model, P_B and P_S should be understood as prices charged to consumers (buyers) and developers (sellers), respectively, for a transaction made on the platform. These prices are distinct from the price of the actual product being purchased (App downloads). Maximizing profit (by taking the derivative of the profit equation with respect to both prices) leads to an optimal pricing rule under a two-sided monopoly platform:

(V.1) $$\frac{P_B + P_s - C}{P_B + P_s} = \frac{1}{\varepsilon_B + \varepsilon_S}$$

where $\varepsilon_B, \varepsilon_S$ are the price elasticities of demand for the buyer and seller, respectively.[677] The left-hand side of this expression represents the platform operator's per-unit margin. In maximizing its profit, the monopolist will choose to set platform prices to buyers and sellers according to their price elasticities of demand, and C represents the platform operator's incremental cost of executing a transaction. As observed in Rochet and Tirole 2003, when expressing the total price charged by the platform ($P = P_B + P_S$) and the combined elasticity with respect to both sides of the market faced by the platform ($\varepsilon = \varepsilon_B + \varepsilon_S$), Equation (V.1) simplifies to what is known as the Lerner index, the standard inverse elasticity formula:

(V.2) $$\frac{P - C}{P} = \frac{1}{\varepsilon}$$

This expression is widely recognized in economic theory and suggests that firms with pricing power increase prices until the markup of price over marginal cost is equal to the inverse of the firm's own-price elasticity.[678]

b. Application of the Two-Sided Monopoly Platform Model to the Play Store

296. I now adapt the Rochet-Tirole model set out above to fit the current circumstances. I accommodate three key features that distinguish the adapted model from the foundational monopoly model described above. *First*, Google charges a take rate to developers on the Play Store as a percentage of developers' revenues rather than a per-unit price. *Second*, as I demonstrate later in Part VI.D using standard economic principles, the take rate imposed on developers is passed

676. *See, e.g.,* John M. Newman, *Antitrust in Zero-Priced Markets: Foundations*, 164 PENN LAW REVIEW 149-206 (2015). The consumer also pays for access by sharing her data with the platform operator.

677. Rochet & Tirole at 996-997. In mathematical terms, the elasticity of demand is defined as the percentage increase in demand divided by the percentage decrease in prices.

678. *See, e.g.,* Landes & Posner at 937 (1981).

through at least in part to consumers. This pass-through results in product prices that will be affected by the take rate. *Third*, through its Play Points loyalty program and other promotions, Google offers a subsidy (a negative platform price) on the consumer side.

297. I define the take rate t as the commission charged by Google to developers for using the platform (typically 30 percent with the exceptions discussed above). The per-unit amount paid to Google by the developer is equal to the take rate multiplied by the product price, which I will denote as S. For example, if an App is priced at $S = \$10$ and the take rate is 30 percent, Google retains 0.3*$10 = $3. Indeed, this arrangement is analogous to setting platform prices $P_S = tS$. It is important to note that the *product* price S is also affected by the take rate, because the take rate represents a cost to developers, a significant portion of which is typically passed on to consumers in the form of higher product prices. I estimate the rate of pass-through in Section VI.D and denote it here with the symbol γ. The pass-through rate is equal to the portion of an increase in costs incurred by developers (including those from increased commissions), which is passed through to consumers in the form of higher product prices. For example, if costs to a developer increase by one dollar, a pass-through rate of 0.90 means that product prices for consumers increase by $0.90. Allowing for this relationship, Equation (V.1) becomes:

(V.3)
$$\frac{P_B + tS - C}{tS + t^2 S'} = \frac{1}{\varepsilon_{B,t} + \varepsilon_{S,t}}$$

where $\varepsilon_{B,t}$ and $\varepsilon_{S,t}$ are price elasticities of demand for transactions from buyers (consumers) and sellers (developers), respectively, now taken with respect to the take rate t, which takes the place of the platform price, and $t^2 S'$ is an additional term which accounts for the effects of the take rate on the product price.[679] Appendix 3 contains a derivation of Equation (V.3).

2. The Platform Model in a Competitive Setting

a. The Foundational Competitive Model

298. When competition to the platform monopolist is introduced, both buyers and sellers can connect to more than one platform, which, as discussed above, is known as multi-homing.[680] With multi-homing, the monopolist loses some pricing power, resulting in a lower equilibrium take rate. The competitive pressure on the take rate occurs through two channels: (1) the platform's

679. S' represents the amount by which the product price S changes when there is a change in the take rate. Appendix 3 contains further details regarding this term.

680. Rochet & Tirole at 991-992 ("In a number of markets, a fraction of end users on one or the two sides connect to several platforms. Using the Internet terminology, we will say that they 'multihome.' For example, many merchants accept both American Express and Visa; furthermore, some consumers have both Amex and Visa cards in their pockets. Many consumers have the Internet Explorer and the Netscape browsers installed on their PC, and a number of Web sites are configured optimally for both browsers.").

incentive to attract sellers, and (2) sellers' ability to steer buyers by way of lower product (in this case App) prices.[681]

299. All else equal, sellers will prefer to use the platform that charges a lower seller-side platform price (P_S), assuming that the alternative platform is roughly comparable and therefore attracts a significant base of consumers. A competing platform under this assumption can therefore attract sellers away from a rival by offering a lower platform price. This first effect on platform prices, namely downward pressure in the face of competition, is analogous to the familiar forms of price competition that occur in countless industries.

300. A second effect stems from sellers' incentive to avoid a higher take rate, all things equal, while having access to the most buyers possible. Because sellers here set their own product prices, they can "steer" buyers to a platform by offering lower product prices on that platform. Steering is facilitated when a rival platform charges a lower platform price, because a seller using the platform with a lower platform price has a price differential available to lower prices and steer customers.

301. In a competitive platform setting, the platform's optimal pricing rule from Equation (V.1) becomes:[682]

(V.4)
$$\frac{P_B + P_S - C}{P_B + P_S} = \frac{1}{\varepsilon_{OB} + \varepsilon_{OS}}$$

This formula now reflects the buyers' "own-brand" elasticity, ε_{OB}, and the sellers' "own-brand" elasticity, ε_{OS}. Own-brand elasticity is the change in demand for a given platform due to an increase in the price of transacting on that particular platform. This elasticity varies from the elasticity in the monopoly setting due to the presence of competition from rival platforms. In a monopoly setting, a consumer may choose not to transact in the face of a price increase but will not have the option of transacting on an alternative platform. In a competitive setting, a consumer may choose not to transact at all or may choose to transact on a competing platform. The presence of a competitive option suggests a greater elasticity of demand relative to that of the monopoly setting.

302. The own-brand elasticities cause the denominator on the right-hand side of Equation (V.4) to increase relative to the denominator in Equation (V.1). This higher denominator leads to a lower margin on the left-hand side, which implies lower equilibrium platform prices ($P_B + P_S$) in the presence of competition.

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681. *Id.* at 1001 ("This increases demand for Platform 1 in two ways: The platform attracts new merchants…and 'steers' former multihoming merchants.").

682. *Id.* at 1004. I derive this expression by replacing market demand faced by the platform operator (in the monopoly setting) with residual demand, where residual demand is defined as market demand minus demand that is met by the platform's rivals. Rochet and Tirole model competition in the form of a duopoly and express the seller side own-brand elasticity as $\varepsilon_{OS} = \varepsilon_S/\sigma$, where σ is a single-homing index. I use the more general notation to show that in my extension of the model, I am agnostic to the number of competing platforms faced by Google, as long as there is at least one rival. Appendix 3 provides details regarding this derivation.

b. Application Of The Two-Sided Competitive Platform Model to The Instant Case

303. Applying the competitive model to this case results in an expression analogous to Equation (V.4):

(V.5) $$\frac{P_B + tS - C}{tS + t^2 S'} = \frac{1}{\varepsilon_{OB,t} + \varepsilon_{OS,t}}$$

As in Equation (V.3), the platform prices P_s on the left side of the expression has been replaced with its take rate analogue (tS), and there is an additional term in the denominator which accounts for the effect of a new take rate on product prices. The platform price elasticities on the right-hand side have also been replaced with their take rate analogues, now reflecting the introduction of competition ($\varepsilon_{OB,t}$ is own-brand elasticity of demand taken with respect to the take rate on the buyer side, and $\varepsilon_{OS,t}$ is own-brand elasticity of demand taken with respect to the take rate on the seller side). As in the foundational model, the competitive elasticity terms imply a lower take rate in this equation. Table 5 summarizes these equations, comparing the foundational framework with the extension that allows for a percentage take rate. Details of how these expressions are derived are in Appendix 3.

TABLE 5: EQUILIBRIUM EXPRESSIONS OF THE ROCHET-TIROLE MODEL APPLIED TO THE INSTANT CASE

Scenario	Foundational Model	Applied Model
Monopoly	$\frac{P_B + P_s - C}{P_B + P_s} = \frac{1}{\varepsilon_B + \varepsilon_S}$ (Eqn. (V.1))	$\frac{P_B + tS - C}{tS + t^2 S'} = \frac{1}{\varepsilon_{B,t} + \varepsilon_{S,t}}$ (Eqn. (V.3))
Competitive	$\frac{P_B + P_S - C}{P_B + P_S} = \frac{1}{\varepsilon_{OB} + \varepsilon_{OS}}$ (Eqn. (V.4))	$\frac{P_B + tS - C}{tS + t^2 S'} = \frac{1}{\varepsilon_{OB,t} + \varepsilon_{OS,t}}$ (Eqn. (V.5))

3. Calibrating the Model and Required Inputs

304. Once the model is "calibrated" in the sense that it relates the observed variables in the monopoly setting in Table 5 and solves for the unobserved variables, the model can be used to project Google's take rate in a competitive setting. I demonstrate impact by proceeding in two steps. *First*, I calibrate the Applied Model in the monopoly scenario by estimating inputs in the observed setting in which Google wields monopoly power in the Android App Distribution Market, thus satisfying Equation (V.3). The model's inputs are informed entirely by paid Apps in the Android App Distribution Market, as those are the only Apps that are priced and thus exhibit an observable own-price elasticity of demand. *Second*, I use the competitive inputs—namely, the take rate elasticities of demand—to determine a competitive take rate in a competitive (but-for)

world, thus satisfying Equation (V.5). Data obtained from Google and other sources can be used in the applied monopoly and competitive models. In the descriptions below, I use the superscript ^{M} to denote inputs to the monopoly model (Equation (V.3)) and the superscript ^{C} to denote inputs to the competitive model (Equation (V.5)). My sources and methods for obtaining the monopoly scenario inputs shown in Equation (V.3) are:

- P_B^M is equal to the price "charged" by Google to consumers for transactions made on its platform in the monopoly scenario. Through its Play Points loyalty program and other promotions, Google effectively charges a small negative price to consumers. As it does in the actual world, Google maximizes its profits with respect to all Apps collectively, not App-by-App. Therefore, I use Google's average subsidy across all Apps, not individual subsidy amounts, to calculate P_B^M. I compute the value of this subsidy as the sum of all promotions paid by Google for paid Apps downloaded in the Android App Distribution Market divided by the total quantity of paid Apps downloaded in the Android App Distribution Market, per Google's transaction records.

- t^M is equal to the observed take rate, computed as the sum of all revenue retained by Google in the Android App Distribution Market divided by the sum of total revenue spent by consumers in the Android App Distribution Market. t^M therefore represents the portion of consumer spending that Google "takes" from the developer. I calculate t^M prior to extracting Google's promotional payments to consumers (promotional payments are captured by P_B^M).

- S^M is equal to the average price charged for Apps in the Android App Distribution Market (for paid App downloads only) in the monopoly setting. In the monopoly model, S^M is total consumer expenditure (prior to receiving promotions from Google) in the Android App Distribution Market divided by the total quantity of paid Apps downloaded, as observed in Google's transaction records. As it does in the actual world, Google would maximize its profits with respect to all Apps collectively, not App-by-App. Therefore, I use Google's average App price across all Apps, not individual App prices, to calculate S^M.

- Marginal cost C represents the incremental cost incurred by Google in executing a transaction. I refer to Google's financial data to infer this value, which suggests that transaction fees and direct costs that Google records for the Play Store (excluding content costs) are [redacted] percent of consumer expenditures.[683]

- γ is equal to the change in the App price S charged to consumers with respect to a change in developers' costs (including the cost imposed on developers through Google's take rate), also known as the pass-through rate. This parameter is discussed in detail in Part VI.D,

683. I estimate that Google's direct costs of sales and direct operating expenses for the Play Store (excluding irrelevant content costs for movies, television, and books) to be [redacted] of consumer expenditures on the Play Store for the period 2016 – 2021. In addition to transaction fees, the Play Store's direct costs of sales includes content costs, customer support, and other costs. I include all of these except content costs; these are costs Google incurs for sales of books, movies, and television, and are not part of the relevant markets here. I also include all direct operating expenses, which include payroll & stock-based compensation, as well as the following non-payroll costs: professional services, advertising and promotional expenses, equipment, and other expenses (travel and entertainment, office and related expenses). *See* work papers for this report.

where I estimate its value at approximately 91 percent (91.1 percent). This value implies that an increase in the take rate that adds $1.00 in extra cost to a developer will cause an increase in the price of the App product of $0.91. Mathematically, the pass-through rate is:

(V.6)
$$\gamma = \frac{\text{change in revenue}}{\text{change in costs}}$$

- S'^M represents the change in the product price resulting from a small change in the take rate. I solve for S'^M in terms of the take rate and pass-through rate: $S'^M = \frac{\gamma}{(1-t^M\gamma)}S^M$. Appendix 3 contains a derivation of this expression.

- $\varepsilon^M_{B,t}$ and $\varepsilon^M_{S,t}$ are the take-rate elasticities of demand for transactions in the Android App Distribution Market from consumers and developers, respectively, in the presence of Google's monopoly. $\varepsilon^M_{B,t}$ reflects the change in the quantity demanded by consumers for Android App Distribution Market transactions associated with a change in the take rate in a monopoly setting. A change in the take rate affects the price at which App products (paid App downloads and purchases of In-App Content) are set via pass-through, which in turn affects consumer demand. $\varepsilon^M_{S,t}$ reflects the change in the number of paid Apps sold by developers in response to a change in the take rate in a monopoly setting. Given the other inputs to the monopoly model, the value of $\varepsilon^M_{B,t} + \varepsilon^M_{S,t}$ is implied by Equation (V.3). Further description of these inputs is included in Appendix 3.

I hold inputs C and γ fixed between the monopoly and competitive scenarios. My sources and methods for obtaining the remaining inputs to the competitive scenario expression shown in Equation (V.5) are:

- P^C_B is equal to the price "charged" by Google to consumers for transactions made on its platform in the competitive scenario. Holding the buyer-side platform price fixed in proportion to the product price yields: $P^C_B = \left(\frac{P^M_B}{S^M}\right) * S^C$.[684]

- t^C is equal to the but-for (competitive) take rate. I calculate the but-for take rate by finding the value that satisfies Equation (V.5) given the remaining inputs.[685]

- S^C is the price of paid App downloads that developers would charge in a competitive scenario. S^C can be inferred if the pass-through rate is known by using Equation (V.6). In particular, plugging in the change in revenue and change in costs associated with the monopoly versus a competitive scenario:

684. In Section VI.E, I model a scenario in which the locus of competition occurs on the buyer-side platform price P_B, resulting in a but-for buyer-side platform price that differs from the observed, monopolistic price.

685. If all the inputs to Equation (V.5) are known except for the take rate, I can solve for the take rate that satisfies the equation.

(V.7)
$$\gamma = \frac{\text{change in revenue}}{\text{change in costs}} = \frac{(S^M - S^C) * \text{quantity}}{(t^M S^M - t^C S^C) * \text{quantity}}$$

This expression can be further simplified and re-arranged to express the competitive price S^C in terms of other inputs:

(V.8)
$$S^C = S^M \frac{1 - \gamma t^M}{1 - \gamma t^C}$$

- S'^C represents the change in the product price resulting from a small change in the take rate in the competitive setting. I solve for S'^C in terms of the take rate and pass-through rate: $S'^C = \frac{\gamma}{(1 - t^C \gamma)} S^C$. Appendix 3 contains a derivation of this expression.

- $\varepsilon^C_{OB,t}$ and $\varepsilon^C_{OS,t}$ are the "own-brand" take-rate elasticities of demand for transactions in the Android App Distribution Market for consumers and developers, respectively, in the presence of competition. $\varepsilon^C_{OB,t}$ reflects the change in the quantity demanded by consumers for Android App Distribution Market transactions—from Google in particular, hence, "own-brand"—associated with a change in Google's take rate. Relative to its monopoly analogue, this parameter reflects a scenario where Google faces competition from rival platforms; as such, the parameter will be greater in magnitude than the monopoly elasticity, because the presence of a competitor allows easier defection by consumers in the presence of a price increase from Google, and thus more sensitivity. $\varepsilon^C_{OS,t}$ reflects the change in the quantity of transactions demanded by developers—on the Play Store in particular, hence "own-brand"—in response to a change in the take rate, again in the presence of platform (App store) competition. To inform the but-for competitive elasticities as shown in the denominator of Equation (V.5), $\varepsilon_{OB,t} + \varepsilon_{OS,t}$, I draw from the economics literature, empirical evidence of industries that have shifted from monopoly to competition. I conservatively estimate that Google's take rate elasticities shift from a value of 2.14 (in the monopoly setting, as calculated using Equation (V.3)) to 2.58 in the competitive setting. I arrive at 2.58 using the relationship between own-brand elasticity and market demand elasticity, and under the conservative assumption that Google maintains a 60 percent market share with an inelastic supply response from Google's rivals.[686] These inputs are defined mathematically in Appendix 3.

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686. Similar to Part VI.C, *infra*, I use the relation $E_g = \frac{E_M}{S_g} + \frac{E_S(1-S_g)}{S_g}$ where E_g is Google's own-brand elasticity, E_M is market elasticity, S_g is Google's market share, and E_S is the elasticity of supply of Google's rivals (conservatively set to zero). *See* Landes & Posner at 939-940. I conservatively assume Google maintains a 60 percent market share in a competitive market and that $E_S = 0$. AT&T saw its market share decline to approximately 60 percent by the early 1990s after losing its monopoly. *See, e.g.,* Simran Kahai, David Kaserman & John Mayo, *Is the "Dominant Firm" Dominant? An Empirical Analysis of AT&T's Market Power*, 39 JOURNAL OF LAW & ECONOMICS 499-517 (1996). This implies that the buyer price elasticity of demand changes from 5.383 in the monopoly setting (estimated using Equation V.11) to 8.97 = 5.383/0.6 in the competitive setting, which translates to a competitive take rate elasticity of 2.284, and that the seller price elasticity of demand changes from 0.140 (calculated using Equations

4. Competitive Take Rate Results

305. Table 6 summarizes the results of calculating inputs as described above. As seen below, Table 6 uses both the Google Transaction Data and the App Revenue Metrics data. I estimate that in the but-for world, platform competition results in a competitive take rate of [redacted] percent, down from its observed value of [redacted] percent in the actual world. This result is calculated from Equation (V.5), by finding the value for t that satisfies the equation, given all other inputs. As Table 6 shows, at a pass-through rate of $\gamma = 91.1$ percent, the resulting but-for average price of paid App downloads in the Android App Distribution Market is [redacted], down from the observed price of [redacted] (net of Google's promotional expenditures to consumers). This difference results in an average overcharge to consumers of [redacted] per paid App download (equal to [redacted]), which demonstrates impact, and results in aggregate damages of [redacted] (equal to [redacted]) as a result of Google's restrictions in the Android App Distribution Market, across the Class Period (August 16, 2016, through May 31, 2022) for the U.S. As explained below, there are additional damages and impact in the In-App Aftermarket.[687]

V.3 and A.22) to 0.233 = 0.140/0.6, which translates to a competitive seller take rate elasticity of 0.292 (see Appendix 3 for details on the relation between the price elasticities of demand and take rate elasticities of demand). The sum total of both competitive elasticities is then equal to 2.284 + 0.292 = 2.58.

687. In the event that proof of pass-through is not necessary under the law, I have been asked to calculate damages based on the full reduction in the take rate in the but-for world. I do so in Part VII.A below.

TABLE 6: ANDROID APP DISTRIBUTION MARKET IMPACT AND DAMAGES
(U.S., 8/16/2016 – 5/31/2022)

Actual World (Monopoly, Eqn. (3))

#	Input	Description	Value	Source/Notes
[1]		Consumer Expenditure (US; Before Discounts)	[redacted]	GOOG-PLAY 005535886; Google Transaction Data (US Consumers)
[2]		Google Revenue (US; Before Discounts)		*Id.*
[3]		Google Promotional Expenditures (US)		*Id.*
[4]		Android App Distribution Market (Paid) Transactions (US)		*Id.*
[5]=[1]/[4]	S^M	App Product Price Before Discounts		Calculated
[6]=[2]/[1]	t^M	Take Rate		Calculated
[7]=-[3]/[4]	P_B	Buyer-side Platform Price		Calculated
[8]=[5]+[7]	$S^M + P_B$	App Product Price Net of Discounts		Calculated
[9]	C	Marginal Cost		GOOG-PLAY-000416245; GOOG-PLAY-010801682
[10]	γ	Pass-through Rate		Estimated (See Table 13)
[11]	$\varepsilon^M_{B,t} + \varepsilon^M_{S,t}$	Take Rate Elasticities of Demand		Calculated (Eqn. (V.3))

But-For World (Competitive, Eqn. (5))

#	Input	Description		Source/Notes
[12]	S^C	App Product Price		Calculated (Eqn. (V.8))
[13]	t^C	Take Rate		Calculated (Eqn. (V.5))
[14]=([7]/[5])*[12]	P_B	Buyer-side Platform Price		Calculated
[15]=[12]+[14]	$S^C + P_B$	App Product Price Net of Discounts		Calculated
[16]=[9]	C	Marginal Cost		GOOG-PLAY-000416245; GOOG-PLAY-010801682
[17]=[10]	γ	Pass-through Rate		Estimated (See Table 13)
[18]	$\varepsilon^C_{OB,t} + \varepsilon^C_{OS,t}$	Take Rate Elasticities of Demand		Economic theory/empirical studies
[19]=[8]-[15]		Consumer Savings Per Transaction		Calculated
[20]=[19]*[4]		**Aggregate Damages**		Calculated

Notes: Expenditures, revenues, and unit totals are limited to transactions on smartphones and tablets. I calculated these using GOOG-PLAY 005535886 (Google App Revenue Metrics Data) over the period 8/16/2016-1/31/2017, [redacted] I calculated Google promotional expenditures as follows: For the period 8/2016 – 1/2017, I summed the [redacted] fields from the App Revenue Metrics data. For the period 2/2017 – 5/2022, I relied on the Google Transaction Data, which provides a

[redacted]. I calculated the difference between the initial purchase buyer-to-developer revenue distribution, which is approximately equal to the [redacted] before discounts are applied, and the pre-tax consumer spend net of discounts. Correspondence from Google suggests that [redacted]. *See* Letter from Brian C. Rocca, Morgan Lewis, to Gregory Arenson, Kaplan Fox & Kilsheimer LLP, in re Google's Transactional data (January 14, 2022) ("[redacted]"). To be conservative, I also aggregated Play Points earned across all transactions, assigned each point a dollar value of [redacted], and added this to the promotional expenditures total. *See* Shelby Brown, *Google Play Points Could Help You Save Money. Here's How*, CNET (Feb. 21, 2022), *available at* https://www.cnet.com/tech/services-and-software/google-play-points-could-help-you-save-money-heres-how/ ("A $1 Google Play credit costs 100 Play Points"). *See also* Letter from Brian C. Rocca, Morgan Lewis, to Gregory Arenson, Kaplan Fox & Kilsheimer LLP, in re Google's Transactional data (October 11, 2021) at 61-62 ([redacted]).

306. Developer-specific take rates can be computed by applying the proportion of discounts granted in the actual world to the competitive but-for take rate. For example, suppose that the overall take rate is 30 percent in the actual world. Suppose a developer has an actual take rate of 29 percent (one percentage point below the overall rate). Suppose that the overall but-for take rate is 23 percent. In this example, the developer's but-for take rate would be calculated as [23 percent] x [29 percent]/[30 percent] = 22.2 percent. The pass-through rate γ (which I set equal to 91.1 percent for this analysis) may also vary across categories of Apps. Differential pass-through rates can be readily estimated (see Part VI.D.3) and inserted into the model to determine competitive but-for take rates that vary across App category, as illustrated in Part VII below. U.S. Consumers who made purchases in those App categories were accordingly subject to overcharges; lower take rates associated with consumer purchases in the but-for world would be passed through in the form of lower App prices relative to the actual world.

5. Analysis Of Similar Platforms Corroborates My Competitive Take Rates For Initial App Downloads

307. The framework described above demonstrates the economics of two-sided platforms and allows estimation of a take rate for the Android App Distribution Market in a competitive but-for world. This model is particularly useful in the present context where the Challenged Conduct has been inherent to Google's business practices since approximately the inception of the Play Store, preventing a "before, during, and after" comparison. A comparative analysis, presented here, can be used to corroborate the results from the two-sided market model. In this section, I review take rates found in similarly situated, two-sided digital platforms. I focus on take rates from platforms where there are no (or fewer) anticompetitive restraints similar to those imposed by Google in the instant case, and the fundamentals of platform economics (connecting two sides of a market) are present. From these examples, several conclusions emerge:

- Platforms facing more competitive conditions compete by lowering their take rates;
- Customer mobility, which hinges on the presence of substitutes and the absence of switching costs, puts downward pressure on the take rate via steering; and
- Take rates in competitive environments reflect the diminishing value offered by the platform over time following the initial matching of buyer and seller.

a. The ONE Store

308. South Korean wireless carrier SK Telecom Co. spearheaded the launch of the ONE Store, a competing mobile App store in 2016.[688] The scale of this effort to compete with Google is a testament to the barriers to entry: it involved cooperation among the three largest Korean wireless carriers (SK Telecom, KT, and LG Uplus), as well as Naver, Korea's largest search engine.[689] These parties were able to achieve near-universal availability in South Korea of the rival App store [redacted][690] The ONE Store achieved a 14.9 percent share of payment volume among App stores in South Korea.[691] The ONE Store has managed to gain share of payment volume in large part thanks to its significantly lower take rates, as well as an aggressive points system for consumers. The ONE Store has a headline 20 percent take rate for developers, which is lowered to five percent if the developer uses its own payment platform.[692] ONE Store's CEO credits its lower take rates compared to Google's 30 percent rate with increasing ONE Store's presence in its domestic market and increasing the number of users purchasing App products (both paid App downloads and purchases of In-App Content).[693] In October 2020, ONE Store announced a 50 percent discount on commissions for small developers (those with revenue less than 5 million won per month).[694]

309. [redacted][695] The ONE store originally charged a 30 percent commission from its launch in March 2016, and cut its take rate to the 20 percent level (five percent if developers provide their own payment platform) in July 2018 to compete against Google.[696] Developers can now (setting aside any restrictions by Google) steer their customers to the lower-cost platform via discounting prices to consumers for Apps. This episode demonstrates that multi-homing competition among App store platforms engenders competition along the take-rate dimension.

310. The scale of the alliance of the three largest wireless carriers in South Korea enabled the ONE Store to overcome the prohibitive restrictions to competition imposed by Google. Google's revenue-sharing agreements with carriers were designed to prevent such a launch of a

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688. Lim Young-sin & Choi Mira, *Korea's home-grown integrated App market One Store on global outreach,* PULSE (Nov. 13, 2019), pulsenews.co.kr/view.php?year=2019&no=938924.

689. *Id.*

690. GOOG-PLAY-000005203.R at -264.R ("[redacted]").

691. Kim Eun-jung, *Korean App market ONE store eyes global alliance to compete with Google*, YONHAP NEWS AGENCY (Dec. 1, 2019), en.yna.co kr/view/AEN20191128004700320.

692. *Id.* ("ONE store cut the rate to 20 percent in July 2018. For App providers with their own payment platform, the firm only charged 5 percent for its service.").

693. *Id.* ("The rate cut not only helped the firm [the ONE Store] to expand its presence in the domestic market but also improved profitability with an increased number of paid users, he said. . . With the additional firepower, Lee said ONE store will bolster efforts to create an alternative global App store capable of competing with Google and enhance the App industry ecosystem. 'A monopolistic market is not healthy for both industry players and consumers,' Lee said. 'We need more competition, not only in the domestic market but also on the global scale.'").

694. ET Telecom.com, *South Korea's App market ONE store grows amid Google's Play store policy row* (Feb. 21, 2021), telecom.economictimes.indiatimes.com/news/south-koreas-app-market-one-store-grows-amid-googles-play-store-policy-row/81135498.

695. *See, e.g.,* GOOG-PLAY-000005203.R at -215.R. *See also* GOOG-PLAY-000445443.R at -451.R.

696. Kim Eun-jung, *Korean App market ONE store eyes global alliance to compete with Google*, *supra*.

competing App store, particularly in the United States.[697] An internal Google presentation notes that [redacted].[698]

b. Aptoide

311. Aptoide, another App store operating worldwide, assesses a maximum take rate of 25 percent[699] and in some cases charges a take rate as low as ten percent.[700] These take rates encourage developers to steer their customers to Aptoide's lower-cost platform. This strategy has paid off; Aptoide presently has over 300 million users worldwide.[701] Aptoide's growth is nevertheless limited by Google's restrictions—for example, consumers cannot download Aptoide through the Google Play Store and instead must go through the cumbersome side-loading process.[702] Moreover, developers are also barred from any form of steering—that is, informing consumers using the Google Play Store that they can use Aptoide for some or all of their transactions.[703]

c. Amazon

312. Although Amazon's Appstore maintained a "headline" take rate of 30 percent, after factoring in discounts to developers and consumers, deposition testimony from Amazon executive Donn Morrill [redacted].[704] Mr. Morrill also testified that [redacted].[705] Amazon

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697. *See, e.g.,* GOOG-PLAY-007315383 [redacted] GOOG-PLAY-001055565 ("[redacted] *See also* GOOG-PLAY-001143425 [redacted]).

698. GOOG-PLAY-002011285.R at -289.R.

699. *See* Aptoide, *For Developers*, en.aptoide.com/company/developers ("Get a minimum of 75% payout rate on in-App purchases in comparison to 70% or even 50% you get with other App distributors.").

700. *See* Revenue Share, Catappult App Distribution Console, docs.catappult.io/docs/distribution-and-revenue-share.

701. *See* Aptoide, *About Us,* en.aptoide.com/company/about-us ("Aptoide is the game-changing Android App Store. With over 300 million users, 7 billion downloads and 1 million Apps, Aptoide provides an alternative way to discover Apps and games, with no geo-restrictions and one of the best malware detection systems in the market.").

702. Aptoide, *How to download and install Aptoide?,* en.aptoide.com/company/faq/how-to-download-install-aptoide.

703. *See* Google – Play Console Help, *Understanding Google Play's Payments policy*, support.google.com/googleplay/android-developer/answer/10281818?hl=en#zippy=%2Ccan-i-distribute-my-app-via-other-android-app-stores-or-through-my-website%2Ccan-i-communicate-with-my-users-about-alternative-ways-to-pay%2Ccan-i-communicate-with-my-users-about-promotions-on-other-platforms ("Within an app, developers may not lead users to a payment method other than Google Play's billing system unless permitted by the Payments policy. This includes directly linking to a webpage that could lead to an alternate payment method or using language that encourages a user to purchase the digital item outside of the app.").

704. Morrill Dep. 86:16-88:11 [redacted]).

705. Morrill Dep. 73:5-74:20.

announced in June 2021 that it would reduce its headline take rate from 30 percent to 20 percent for small developers with less than $1 million in revenues, similar to other platforms.[706] Financial data produced by Amazon [redacted].[707] For Google Android devices, after factoring in discounts to developers and consumers, Amazon's take rate was [redacted] from 2018 – 2021.[708]

313. Amazon has offered significant subsidies on the consumer side. Mr. Morrill testified that [redacted].[709] Mr. Morrill testified that [redacted].[710] Google's [redacted] indicates that [redacted].[711] The Amazon Appstore's consumer subsidies on Google Android devices came to over [redacted] of consumer expenditure from 2018 – 2021.[712]

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706. Sarah Perez, *Amazon's Appstore lowers its cut of developer revenue for small businesses, adds AWS credits*, TECHCRUNCH (June 17, 2021), techcrunch.com/2021/06/17/amazons-Appstore-lowers-its-cut-of-developer-revenue-for-small-businesses-adds-aws-credits/.

707. Equal to [redacted] in net revenue divided by [redacted] in consumer expenditure. *See* AMZ-GP_00005729 ([redacted]). *See also* Morrill Dep. 97:7-11 [redacted]")

708. Morrill Dep. 87:10-25 ("[redacted]"). *See also* AMZ-GP_00002471 ([redacted]). *See also* Morrill Dep. 84:8-11 [redacted])

709. Morrill Dep. 89:8-90:19 [redacted].

710. *Id.* Mr. Morrill confirmed that [redacted]. *Id.* at 91:4-11.

711. GOOG-PLAY-000879194.R at -204.R.

712. *See* AMZ-GP_00002471 ([redacted]t). *See also* Part VII.C below.

According to a 2020 Amazon document, [redacted][713]

d. PC Game Platforms

314. Despite not being a participant in the Android App Distribution Market, video game distribution platforms on PCs are similar to mobile App distribution platforms in that they also connect developers of software applications to consumers without requiring a particular console (like an Xbox or PlayStation).[714] The three dominant platforms through which PC games are bought and sold are Steam, Epic, and Microsoft.[715] Indeed, Google has noted that [redacted][716] The Epic Games Store was launched in December 2018 with a take rate of 12 percent.[717] Microsoft announced a reduction from 30 percent to 12 percent for games sold through its store, beginning August 1, 2021.[718] Effective October 2018, Steam also announced a take-rate reduction from 30 percent to a tiered system: 30 percent for the developer's first $10 million in revenue, 25 percent for sales between $10 and $50 million, and 20 percent for sales more than $50 million.[719] Discord, a PC game platform monitored by Google, imposes a ten percent revenue share.[720]

e. PC App Stores

315. Effective August 1, 2021, Microsoft charged a 12 percent take rate for consumer non-game Apps sold in the Microsoft Store (on devices other than Xbox and those using Windows 8), reduced from 15 percent.[721] Importantly, these commissions only apply when the developer is

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713. AMZ-GP_00002484, at 2488.

714. Take rates for video games played on consoles such as Xbox and Playstation may reflect the cost recovery of the hardware.

715. Steam is estimated to control roughly three quarters of PC gaming sales, followed by Epic (between two and 15 percent) and Microsoft. *See, e.g.,* Kyle Orland, *Humble Bundle creator brings antitrust lawsuit against Valve over Steam*, ARS TECHNICA (Apr. 30, 2021), arstechnica.com/gaming/2021/04/humble-bundle-creator-brings-antitrust-lawsuit-against-valve-over-steam/.

716. GOOG-PLAY-000542516.R at -529.R.

717. Epic Games, *The Epic Games store is now live* (Dec. 6, 2018), www.epicgames.com/store/en-US/news/the-epic-games-store-is-now-live ("The Epic Games store is now open, featuring awesome high-quality games from other developers. Our goal is to bring you great games, and to give game developers a better deal: they receive 88% of the money you spend, versus only 70% elsewhere. This helps developers succeed and make more of the games you love.").

718. Tom Warren, *Microsoft shakes up PC gaming by reducing Windows store cut to just 12 percent*, THE VERGE (Apr. 29, 2021), www.theverge.com/2021/4/29/22409285/microsoft-store-cut-windows-pc-games-12-percent.

719. Brittany Vincent, *Valve Introduces New Revenue Split Changes For Steam Sales,* VARIETY (Dec. 3, 2018), variety.com/2018/gaming/news/valve-revenue-split-changes-1203078700/.

720. GOOG-PLAY-007329076 at -084.

721. Microsoft Store, *App Developer Agreement Version 8.7* (Effective July 28, 2021), query.prod.cms.rt microsoft.com/cms/api/am/binary/RE4OG2b ("Fifteen percent (15%) of Net Receipts for any Apps (and any In-App Products in such Apps, including) that are not listed in Section 6(b)(iii) below. ii. For all Net Receipts generated on or after August 1, 2021: Twelve percent (12%) of Net Receipts for any Games (and any in-App Products in such Games) that are not listed in Section 6(b)(iii). iii. Thirty percent (30%) of Net Receipts for: 1. all Apps and In-App Products acquired by Customers in the Microsoft Store on an Xbox console and billed to such Customers on a non-subscription basis; 2. all Games (and In-App Products in Games) acquired by Customers in the Microsoft Store on an Xbox console; and 3. all Apps and In-App Products acquired by Customers in the Microsoft Store on Windows 8 devices; or Microsoft Store on Windows Phone 8 devices.").

using the Microsoft commerce platform to "support the purchase of your App or any in-App Products" (analogous to Google's billing system).[722] Also as of August 1, 2021, Microsoft charged a *zero* percent take rate for non-game Apps downloaded through the Windows 11 Store if the developer chose to use its own or a third-party commerce platform to facilitate in-App purchases.[723] More specifically, the Microsoft Store charges game developers 12 percent of revenue; non-game App developers pay 15 percent of revenue if they use Microsoft platform for their in-App transactions, but zero percent if they do not:

> Many developers love the Microsoft Commerce platform because of its simplicity, global distribution, platform integration and its competitive revenue share terms at 85/15 for Apps and 88/12 for games. Starting July 28, App developers will also have an option to bring their own or a third party commerce platform in their Apps, and if they do so they don't need to pay Microsoft any fee. **They can keep 100% of their revenue**."[724]

316. The Microsoft PC App store faces competition from direct downloads—consumers can easily discover a new application on the Internet and download it to the personal computer without using Microsoft as an intermediary. Given the competition from direct App downloads, Microsoft only charges a take rate when it performs the services of matchmaking—connecting the consumer to the app—and billing services are provided.

f. Other Examples

317. Additional examples of take rates more competitive than Google's abound in other, similarly situated industries with two-sided platforms. In independent online publishing, one of the leading platforms, Substack, which brings together writers and readers, takes a ten percent commission from writers, recognizing the low switching costs: "Moving one's email list away from Substack is simple, so the firm lets writers keep 90% of their revenues."[725] This ease of mobility increases writers' elasticity of supply, which puts downward pressure on the take rate. Revue, a competitor to Substack now owned by Twitter, charges only a five percent take rate.[726] Google's Chrome web store, which provides extensions, themes, and Apps associated with its

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722. *Id.* at 13-14 ("Commerce Platform Requirements. Purchases made on a third-party commerce engine are not subject to the Store Fee, but are still required to comply with our Certification Requirement.").

723. Giorgio Sardo, General Manager – Microsoft Store, *Building a new, open Microsoft Store on Windows 11*, MICROSOFT WINDOWS BLOGS (Jun. 24, 2021), blogs.windows.com/windowsexperience/2021/06/24/building-a-new-open-microsoft-store-on-windows-11/.

724. *Id.* (emphasis added); *see also* Alex Hern, *Microsoft to let developers keep all their Windows App store revenue*, THE GUARDIAN (June 25, 2021), theguardian.com/technology/2021/jun/25/microsoft-let-developers-keep-all-windows-app-store-revenue. ("As part of the shift to Windows 11, unveiled on Thursday, the company will allow developers to use their own payment systems on Apps they sell through the Windows store. Those who do will not have to pay a penny to Microsoft."). Thus far, Microsoft has declined to unbundle its billing system for game developers: "A different set of rules apply for game developers: their share is lower, at 12%, but they will not be given the option of using their own payment processors." *Id.*

725. The Economist, *The new rules of the 'creator economy'*, (May 8, 2021), economist.com/briefing/2021/05/08/the-new-rules-of-the-creator-economy.

726. Max Willens, *Cheat sheet: Twitter's acquisition of Revue heats up the battle of the inbox*, DIGIDAY (Jan. 27, 2021), digiday.com/media/cheat-sheet-twitters-acquisition-of-revue-heats-up-the-battle-of-the-inbox/ ("Revue will remain a separate brand, but Twitter will provide the resources to make Revue more competitive with other newsletter platforms; the commission Revue takes on all consumer revenue has been reduced to 5%, half of what Substack charges. All of the Pro features for Revue will be freely available to all Revue users as well. Twitter will also help Revue hire more people across research, design and engineering.").

browser, charges a five percent take rate, recognizing the value of attracting developers who might otherwise produce content for other browsers.[727] Take rates for online retail from vendors such as Amazon, eBay, and Etsy range from eight to fifteen percent with a small additional lump sum on the order of $0.30-$0.99.[728]

318. Table 7 offers a non-comprehensive summary of take rates in comparable competitive digital platform environments. Google's competitive but-for take rate from my two-sided platform model of [redacted] is corroborated by rates charged by competitive mobile App stores (18 to 25 percent), and is conservative compared to the take rates imposed by other platforms in more competitive industries. Finally, take rates of [redacted] offered by Google pursuant to [redacted] also provide a reasonable approximation of the but-for take rate. Record evidence shows that [redacted].[729] It therefore provides a valid competitive benchmark take rate for developers with take rates at (or close to) Google's standard 30 percent take rate in the actual world (that is, the vast majority of developers).

727. D. Melanson, *Google makes Chrome Web Store available worldwide, adds in-App purchases and flat five percent fee,* ENGADGET (May 11, 2011), www.engadget.com/2011-05-11-google-makes-chome-web-store-available-worldwide-adds-in-app-pu html.

728. *See, e.g.,* Hung Truong, *Compare 9 Online Marketplace Fees* (Sept. 18, 2018), sellerzen.com/compare-9-online-marketplace-fees.

729. GOOG-PLAY-000578299.R at -301.R. *See also* Defendants' Responses and Objections to Developer Plaintiffs' First Set of Interrogatories at 13 [redacted]. *See* Rosenberg Dep. 261:11-262:4. Google offered a [redacted] percent take rate to [redacted]. *See, e.g.,* GOOG-PLAY-000338849.R at -888.R; GOOG-PLAY-004714797; GOOG-PLAY-004717237; Defendants' Responses and Objections to Developer Plaintiffs' First Set of Interrogatories at 14-15; GOOG-PLAY-0006998204.R at -206.R. [redacted] (*see* GOOG-PLAY-000442329 at -345—346; GOOG-PLAY-004717237) [redacted] (see GOOG-PLAY-000338849.R at -888.R; GOOG-PLAY-006998204.R at -206.R).

TABLE 7: BENCHMARK TAKE RATES

Category	Benchmark		Comparable Take Rate
Mobile App Stores	(1)	Aptoide	10-25%
	(2)	ONE Store	5-20%
	(3)	Amazon	18%
PC App Stores	(4)	Microsoft (non-games)	12-15%
PC Games	(5)	Steam (Valve)	20-30%
	(6)	Epic	12%
	(7)	Microsoft Store	12% effective 8/1/2021
Online Retail	(8)	Amazon	8-15% + $0.99/item or $39.99/month
	(9)	eBay	12.55% + $0.35
	(10)	Etsy	8% + $0.45
	(11)	Google	0% (previously 5-15%)
	(12)	Poshmark	20% (for over $15, $2.95 flat fee for under $15 sale)
	(13)	Walmart	6-15%
Online Publishing	(14)	Substack	10% + credit card fee
	(15)	Revue (Twitter)	5%

Sources: (1) Aptoide – Catappult, *Revenue Share*, docs.catappult.io/docs/distribution-and-revenue-share (2) Kim Eun-jung, *Korean App market ONE store eyes global alliance to compete with Google*, *supra*; GOOG-PLAY-007329076 at -084 ([redacted]). (3) Derek Strickland, *Apple's 30% App Store commission is 'supracompetitive,' court declares*, TWEAKTOWN (Sept. 11, 2021), tweaktown.com/news/81567/apples-30-app-store-commission-is-supracompetitive-court-declares/index.html. (showing Amazon's effective take rate of 18.1%); (4) Microsoft Store, App Developer Agreement Version 8.7, *supra;* (5) Brittany Vincent, *Valve Introduces New Revenue Split Changes For Steam Sales*, *supra*; (6) Epic Games, *The Epic Games store is now live*, *supra*; (7) Tom Warren, *Microsoft shakes up PC gaming by reducing Windows store cut to just 12 percent*, *supra*; (8) Amazon, *Let's talk numbers*, sell.amazon.com/pricing; (9) eBay, *Understanding selling fees,* pages.ebay.com/seller-center/get-started/seller-fees.html; (10) Etsy, *Sell,* www.etsy.com/sell (Etsy charges a $0.20 listing fee. When a product is sold, they charge a 5% transaction fee, paired with a 3% + $0.25 payment processing fee); (11) Google Merchant Center Help, *New 0% commission fee for selling on Google through Shopping Actions in the US* (July 23, 2020), support.google.com/merchants/answer/9977875?hl=en; Bryan Falla, *Google Shopping Actions Commission Rates*, GODATAFEED (Oct. 22, 2019), godatafeed.com/blog/google-shopping-actions-commission-structure; (12) Poshmark, *What are the fees for selling on Poshmark,* support.poshmark.com/s/article/297755057?language=en_US; (13) Walmart Marketplace, *Referral Fees,* marketplace.walmart.com/referral-fees/; (14) Substack, *Going Paid,* substack.com/going-paid; (15) Tom McKay, *Twitter Wants to Be Substack Now*, GIZMODO (Jan. 26, 2021), gizmodo.com/twitter-wants-to-be-substack-now-1846136057.

C. Removing Google's In-App Aftermarket Restrictions Would Put Downward Pressure on the Take Rate Google Imposes on Developers for In-App Content

319. Relative to the value provided by the developer, the value that the Play Store contributes by matching a consumer with an App dissipates over time. That is because once a consumer has found an App on the Play Store, the match has been made. Any value added through

the purchase of In-App Content is added entirely by the developer. Google's own documents recognize this.[730]

320. I understand that all of the In-App Aftermarket services that developers are currently forced to use from Google (owing to Google's In-App Aftermarket restrictions) can actually be performed by a third party or the developer itself completely independently of Google. For example, there exists a well-established industry of competitive payment processors in the business of facilitating online transactions.[731]

321. In the competitive but-for world without Google's restrictions, developers could choose their own provider of services in the In-App Aftermarket. Alternatively, developers would be able to offer consumers the choice of selecting from an array of competitive options to provide In-App Content.[732] Elementary economics dictates that this would place downward pressure on Google's take rate, pushing it closer to the marginal cost of providing any services associated with In-App Content. Developers having the ability to steer consumers to lower-cost competitors would reinforce this downward pressure, an outcome that Google has modeled in Project Basecamp.[733] I use standard economic methods to conservatively estimate the extent to which Google's take rate for services in delivering In-App Content would fall when Google's restrictions are removed.

1. A Standard Economic Model of Competition in the In-App Aftermarket

322. To the extent that a competitive In-App Aftermarket would be characterized by homogenous commodity services (payment for and distribution of In-App Content) offered by various competitive rivals with few barriers to entry or expansion, standard economic principles prescribe that Google would be unable to charge a premium for these services.[734] If Google attempted to charge developers anything in excess of the competitive market price for In-App Aftermarket services, then developers would switch to a competitor providing identical services at lower cost, rendering Google's attempted price increase unprofitable.[735] Thus, to the extent that

730. *See, e.g.,* GOOG-PLAY-003335786.R at -805.R ([redacted]).

731. *See, e.g.,* Rob Clymo, Brian Turner, and Jonas DeMuro, *Best payment gateways of 2022*, TECH RADAR (Aug. 22, 2022), www.techradar.com/best/best-payment-gateways; *see also* Table 10 below (listing various competitive payment processors).

732. To comply with recent legislation in South Korea, the Play Store now allows developers to offer South Korean users the choice between Google Play Billing and alternative in-app billing systems. Whenever a user selects an alternative billing system, the take rate for that transaction is reduced by four percentage points. *See, e.g.,* Play Console Help, *Changes to Google Play's billing requirements for developers serving users in South Korea*, support.google.com/googleplay/android-developer/answer/11222040. This is not a competitive market outcome, and instead reflects Google's ongoing monopoly power, through which Google has effectively replicated the Aftermarket Tie-In, by maintaining a high take rate in the In-App Aftermarket even when an alternative billing system is used. The same holds for Google's recent initiative to introduce user choice billing in European Economic Area countries, Australia, India, Indonesia, and Japan. *See* Abner Li, *Google Play opens developer sign-ups for third-party 'User Choice Billing'*, 9TO5 GOOGLE (Sep. 1, 2022), 9to5google.com/2022/09/01/google-play-user-billing-sign-up/. It would be economically irrational for Google to voluntarily relinquish its monopoly power and the profits that come with it.

733. *See* Part VI.D.2 below; *see also* GOOG-PLAY-006829073.R at GOOG-PLAY-006829085.R ([redacted]).

734. *See, e.g.,* MANKIW at 268-284.

735. *Id.*

the competitive In-App Aftermarket is characterized by competition for a commoditized service, Google's equilibrium take rate in the In-App Aftermarket would fall towards the marginal cost of serving that market. As explained below, my economic model of the In-App Aftermarket conservatively allows Google to charge a substantial markup above marginal cost, even in a more competitive world.

323. Record evidence shows that Google's 30 percent take rate in the In-App Aftermarket cannot be justified by the costs of serving that market. As early as 2009, Google recognized that [redacted][736] In another document, Google [redacted][738] The same Google document calculated Google's average cost of payment processing at [redacted] of customer spend for the top 5,000 developers. Google's estimate of its own payment-processing costs are [redacted].[739] Another Google document reports that transaction costs came to [redacted] of consumer spend in the first five months of 2021.[740]

324. Financial data produced by Google allow me to estimate the Play Store's global transaction costs as a percentage of global customer spend in the In-App Aftermarket and the Android App Distribution Market (Google's financial data do not distinguish between the two markets).[741] Even if I conservatively include all the direct costs of sales that Google records for the Play Store (excluding irrelevant content costs for movies, television, and books), as well as all direct operating expenses, I calculate all of these costs came to [redacted] of consumer expenditures on the Play Store for the period 2016 – 2021.[742] Accordingly, Google's cost of providing In-App Aftermarket services can be conservatively estimated [redacted] of consumer expenditures.[743] This implies that Google's standard 30 percent take rate vastly exceeds

736. GOOG-PLAY-004630018.R at GOOG-PLAY-004630024.R.
737. GOOG-PLAY-006829073 at GOOG-PLAY-006829079.
738. GOOG-PLAY-006829073.R at GOOG-PLAY-006829097.R.
739. *Id.* at GOOG-PLAY-006829076.R ([redacted]. When DCB and GC are included, Google estimates that its payment processing costs are [redacted] for 2,300 out of the top 5,000 developers, and [redacted] for the vast majority of developers. *Id.* at GOOG-PLAY-006829075.R.
740. GOOG-PLAY-007617587 [redacted]); *see also* "[redacted].
741. *See, e.g.,* GOOG-PLAY-000416245. Because these are global financial data, they are not comparable to the revenue statistics in Table 6 above and in Table 8 below, which are limited to the United States.
742. In addition to Transaction Fees, the Play Store's Direct Costs of Sales includes [redacted]. I include all of these except [redacted] these are costs Google incurs for [redacted] *See* work papers for this report.
743. Google's cost of providing In-App Aftermarket services is certainly no more than fifteen percent of consumer expenditures, the rate that Google charges to all subscription Apps, effective January 1, 2022. *See* Samat, *Evolving our business model to address developer needs, supra* ("To help support the specific needs of developers

even a conservatively high estimate of its marginal costs ([redacted]), confirming that Google is exercising market power.

325. Google may argue that it would have retained some brand loyalty in the In-App Aftermarket, conferring a degree of pricing power in a competitive world, and thus a deviation from homogenous-product competition contemplated above. In that case, standard economics shows that Google's profit-maximizing price for In-App Aftermarket services would be determined by Google's firm-specific price elasticity of demand (as well as marginal costs).[744] The firm-specific demand elasticity is the percentage decrease in demand for Google's In-App Aftermarket services resulting from a one percent increase in price.[745] Google's profit-maximizing price for In-App Aftermarket services is given by the standard inverse elasticity formula, shown in the equation below.[746]

$$(P-C)/P = 1/E_g \tag{V.9}$$

where E_g represents Google's firm-specific demand elasticity for In-App Aftermarket services, P represents the price for In-App Aftermarket services, and C represents Google's marginal cost of providing In-App Aftermarket services. It bears noting that this elasticity of demand for Google's In-App Aftermarket services (Google Play Billing) is different from the elasticities of demand used in the two-sided model of the Android App Distribution Market for the Play Store.

326. As explained in Landes and Posner's seminal paper, Google's firm-specific demand elasticity is related to the market demand elasticity as follows:[747]

$$E_g = E_M / S_g + E_s (1 - S_g) / S_g \tag{V.10}$$

Above, E_M is the market demand elasticity for In-App Aftermarket services—that is, the percentage decrease in the market-wide quantity demanded resulting from a one percent market-wide increase in price. The term E_s is the elasticity of supply of Google's rivals—that is, the percentage increase in the quantity supplied by Google's rivals, given a one percent increase in Google's price. Finally, S_g is Google's market share. For example, if Google's market share is 100 percent ($S_g = 1$), the equation collapses to $E_g = E_M$. In that scenario, Google's firm-specific elasticity is the same as the market elasticity, because Google would be a monopolist (in the strict economic sense of being literally the only supplier). In contrast, when Google's market share falls below 100 percent, its firm-specific demand elasticity exceeds the market demand elasticity. By the standard inverse-elasticity formula in equation V.9 above, Google's profit-maximizing price under competition is lower than the monopoly price for In-App Aftermarket services.

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offering subscriptions, starting on January 1, 2022, we're decreasing the service fee for all subscriptions on Google Play from 30% to 15%, starting from day one.").

744. *See, e.g.,* Landes & Posner at 939-940.

745. *Id.*

746. *Id. See also* Jerry Hausman & Greg Leonard, *Efficiencies from the Consumer Viewpoint,* 17(3) GEORGE MASON LAW REVIEW 707, 709 (1999) [hereafter Hausman & Leonard].

747. Landes & Posner at 944-945.

327. In the actual world, Google's share of the In-App Aftermarket is close to 100 percent,[748] because Google has prevented competitive entry by forcing developers to purchase from Google In-App Aftermarket services (authorization of In-App Content and payment processing), typically priced at 30 percent of developers' In-App Aftermarket revenue. In a competitive but-for world, elementary economic principles dictate that competitors would enter the market and charge a lower take rate to developers, diverting business from Google and pushing Google's price downward toward marginal cost.[749]

328. Economists have demonstrated empirically that previously monopolistic (or dominant) firms faced with competitive entry lose both market share and pricing power. For example, when AT&T lost its monopoly in long-distance telephone service pursuant to a 1982 divestiture order, it lost substantial market share, and long-distance telephone prices fell substantially, despite any brand loyalty that AT&T may have enjoyed over other long-distance entrants such as MCI.[750] In an article published in the *Journal of Law & Economics*, the authors found that AT&T, which had previously enjoyed a government-sanctioned monopoly, saw its market share decline to approximately 60 percent by the early 1990s.[751] The supply elasticity of AT&T's competitors was estimated at 4.38, consistent with evidence that barriers to entry and expansion in the long-distance market were relatively low during the post-divestiture period.[752] Applying equation V.10 above, the authors calculated that AT&T's firm-specific demand elasticity at between 3.73 and 7.81, which implied price-cost markups of between 13 and 29 percent.[753] These markups are below those found in a range of other industries throughout the economy, indicating that competition had substantially eroded AT&T's market power in the interstate long-distance market.[754] In the absence of competition, AT&T's profit-maximizing prices for long-distance service would have been substantially higher, particularly given that market demand for long-distance service is relatively insensitive to price.[755]

329. Similarly, an econometric analysis of the historically dominant Aluminum Company of America (Alcoa) found that Alcoa's pricing power declined significantly in the

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748. *See, e.g.*, Samat, *Listening to Developer Feedback to Improve Google Play*, *supra* ("Less than 3% of developers with Apps on Play sold digital goods over the last 12 months, and of this 3%, the vast majority (nearly 97%) already use Google Play's billing. But for those who already have an App on Google Play that requires technical work to integrate our billing system, we do not want to unduly disrupt their roadmaps and are giving a year (until September 30, 2021) to complete any needed updates. And of course we will require Google's Apps that do not already use Google Play's billing system to make the necessary updates as well.").

749. *See, e.g.*, MANKIW at 270-282.

750. *See, e.g.,* Simran Kahai, David Kaserman & John Mayo, *Is the "Dominant Firm" Dominant? An Empirical Analysis of AT&T'S Market Power*, 39 JOURNAL OF LAW & ECONOMICS 499-517 (1996) [hereafter Kahai et al.]. *See also* Jeffrey Eisenach and Kevin Caves, *What Happens When Local Phone Service Is Deregulated?* REGULATION 34-41 (2012) at 35 ("There is no disagreement, however, that long distance prices have fallen sharply since liberalization. As shown in Figure 1, in real terms, the price of long-distance service fell by more than 70 percent between 1984 and 2006.").

751. Kahai et al. at 510. This reflects AT&T's output-based market share. Its asset-based market share was even lower, at approximately 40 percent. *Id.*

752. *Id*. at 508.

753. *Id*. at 510 ("The corresponding values of the Lerner index…are 0.29 and 0.13.").

754. *Id.* at 510-513.

755. *Id*. at 509 (reporting market demand elasticities between 0.49 and 0.75).

postwar period, despite substantial barriers to entry and expansion by competitive rivals.[756] The authors estimated the supply elasticity for Alcoa's rivals in the aluminum industry at just 1.4.[757] This was indicative of the substantial capital requirements for primary aluminum producers,[758] and particularly the "extraordinarily high" cost of entry at an efficient scale.[759] Nevertheless, Alcoa's residual demand elasticity was estimated at 8.3, indicating that Alcoa's pricing power, much like AT&T's, had substantially eroded.[760] The authors used the same formula given in equation V.10 above to estimate Alcoa's residual demand elasticity: The market demand elasticity for aluminum was estimated at 2.0.[761] Alcoa's capacity-based market share was approximately 35 percent during the relevant time period.[762] Applying equation V.10, this resulted in a relatively high firm-specific elasticity for Alcoa of 8.3.[763] This relatively high price sensitivity yields a correspondingly low price-cost markup of 12 percent.[764] The authors concluded that, despite the supply constraints faced by Alcoa's rivals, "the aluminum industry has entered a much more competitive market structure in the post-war period."[765] In the absence of competitive entry, Alcoa would have been able to command price-cost markups of approximately 50 percent (equal to $1/E_M = 1/2.0$) rather than 12 percent.

330. I apply this same standard economic framework developed by Landes and Posner (the "Landes-Posner Model") to modeling the but-for take rate in the In-App Aftermarket. These calculations are summarized in Table 8. As seen below, U.S. consumer expenditures in the In-App Aftermarket came to [redacted] between mid-August 2016 (the beginning of the Class Period) and the end of May 2022. Over this timeframe, Google collected [redacted] in U.S. commissions, resulting in a take rate in the actual world of [redacted]. Total U.S. transaction volume was [redacted], implying an average consumer price per transaction [redacted].[766] Google received [redacted] per transaction. Google's marginal cost per transaction is conservatively estimated at [redacted] the average consumer price, or [redacted] per transaction, which yields a markup of price over cost of [redacted]. By the equation (V.9) above, Google's own-firm elasticity is [redacted] By equation (V.10) above, the market demand elasticity is [redacted].[767] The values of these inputs in the actual world are summarized in the first panel of Table 8 below.

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756. Sheng-Ping Yang, *Identifying a dominant firm's market power among sellers of a homogeneous product: an application to Alcoa*, 34 APPLIED ECONOMICS 1411-1419 (2002).

757. *Id.* at 1416.

758. *Id.* at 1412.

759. *Id.* at 1418.

760. *Id.* at 1417.

761. *Id.* at 1416.

762. *Id.* at 1417.

763. Equal to [redacted].

764. Equal to [redacted].

765. *Id.* at 1418.

766. Average revenue is mathematically equivalent to price per unit. *See, e.g.,* MANKIW at 270 ("Average revenue is total revenue (P x Q) divided by the quantity (Q). *Therefore, for all types of firms, average revenue equals the price of the good*.") (emphasis in original).

767. In the actual world, $E_s = 0$ because competitive rivals are constrained by Google's restrictions. Therefore, $E_M = E_g S_g$. *See, e.g.,* MICHAEL KATZ AND HARVEY ROSEN, MICROECONOMICS 3rd ed. 329-330 (Irwin/McGraw-Hill 1998).

TABLE 8: IN-APP AFTERMARKET IMPACT & DAMAGES (U.S., 8/16/2016 – 5/31/2022)

Actual World			
#	**Description**	**Value**	**Source/Notes**
[1]	Consumer Expenditure (US; Before Discounts)	[redacted]	GOOG-PLAY 005535886; Google Transaction Data (US Consumers)
[1a]	Consumer Expenditure (US; Net of Discounts)		*Id.*
[2]	Google Revenue (US; Before Discounts)		*Id.*
[2a]	Google Revenue (US; Net of Discounts)		*Id.*
[3] = [2]/[1]	Google Take Rate		Calculated
[4]	Quantity (Transactions)		GOOG-PLAY 005535886; Google Transaction Data (US Consumers)
[5] = [1a]/[4]	Consumer Price Per Transaction (Net of Discounts)		Calculated
[6] =[2a]/[4]	Google Price Per Transaction (Net of Discounts)		Calculated
[7] = 0.0985*[5]	Google Marginal Cost Per Transaction		Play Financials (equal to [redacted] of consumer expenditure. Includes all direct COS & Direct OpEx)
[8] = ([6] - [7])/[6]	Google Price-Cost Margin		Calculated
[9] = 1/[8]	Google Own-Firm Demand Elasticity		Calculated
[10]	Google Market Share		*See, e.g.*, https://android-developers.googleblog.com/2020/09/listening-to-developer-feedback-to.html
[11] = [10]*[9]	Market Demand Elasticity		Calculated
Absent Google's Restrictions			
#	**Description**		**Source/Notes**
[12]	Google Market Share		Economic principles/empirical studies
[13]	Competitor Supply Elasticity		Economic principles/empirical studies
[14] = [11]/[12] + [13]*(1 - [12])/[12]	Google Own-Firm Demand Elasticity		Calculated
[15] = 1/[14]	Google Price-Cost Margin		Calculated
[16] = [7]/(1 - [15])	Google Price Per Transaction		Calculated
[17] = [6] - [16]	Total Savings Per Transaction		Calculated
[18]	Pass-Through Rate		Estimated (See Table 13)
[19] = [18]*[17]	Consumer Savings Per Transaction		Calculated
[20] = [5] - [19]	Consumer Price Per Transaction		Calculated
[21] = [16]/[20]	Google Take Rate		Calculated
[22] = [4]*[19]	**Aggregate Damages**		Calculated

Notes: See notes for Table 6, *supra*.

331. The values for the parameters in the competitive but-for world are summarized in the second panel of Table 8 above. Even in the presence of substantial competition, I assume conservatively that Google would have retained a substantial market share of 60 percent. As noted above, this was approximately AT&T's market share in the long-distance market after competitive

entry.[768] It is also substantially above Alcoa's market share after competitive entry by capacity-constrained rival aluminum manufacturers (approximately 35 percent).[769] This estimate is also conservative in relation to market share and concentration statistics for e-commerce markets, in which the payment method is generally not tied to the rest of the transaction: There exists a range of payment methods accepted in U.S. e-commerce markets, from credit and debit cards (Visa, Mastercard, etc.) to digital wallet services (such as Amazon Payments, PayPal, Square, and others).[770] Credit and debit cards account for approximately 58 percent of e-commerce transactions; the second largest payment method is digital wallets, at 25 percent.[771] Visa, the largest credit and debit platform, has a market share of 60 percent.[772] Visa's share of e-commerce payments can therefore be estimated at approximately [58 percent] x [60 percent] = 35 percent. Within the second largest category (digital wallet services), the largest firm is PayPal, with a market share of approximately 55 percent.[773] PayPal's share of e-commerce payments can therefore be estimated at approximately [55 percent] x [25 percent] = 13.75 percent.[774] Thus, my analysis assumes that, in a more competitive world, Google would command a substantially greater market share than Visa or PayPal in e-commerce.

332. In the instant case, the elasticity of supply of Google's would-be rivals in the market for In-App Aftermarket services cannot be measured directly, because Google has foreclosed entry and expansion by rivals. In Table 8 above, I set E_s = 4.38, based on the supply elasticity for AT&T's long-distance competitors estimated econometrically in the literature.[775] Using equation V.10, Google's competitive own-firm demand elasticity for In-App Aftermarket services can now be calculated at [redacted], which implies a but-for price-cost margin of [redacted] percent, as seen in Table 8 above. This competitive price-cost margin is well within the range of AT&T's price-cost margins after entry by long-distance competitors (between 13 and 29 percent),[776] and above Alcoa's post-

768. Kahai et al., *supra*, at 510. This reflects AT&T's output-based market share. Its asset-based market share was even lower, at approximately 40 percent. *Id.*

769. Yang, *supra,* at 1417.

770. J.P. Morgan, *E-commerce Payments Trends: United States* (2019), jpmorgan.com/merchant-services/insights/reports/united-states

771. The remainder was accounted for by bank transfers and other methods. J.P. Morgan, *2020 E-commerce Payments Trends Report: US*, jpmorgan.com/merchant-services/insights/reports/united-states-2020. *See also* D. Tighe, *Distribution of e-commerce payment methods in the United States in 2020*, STATISTA, statista.com/statistics/935676/payment-methods-used-for-online-transactions-usa/ (showing credit cards at 30 percent of e-commerce payments, debit cards at 21 percent, and digital wallets at 30 percent).

772. *See, e.g.,* Lewis Krauskopf, *Swiping their way higher: Visa, Mastercard could be the next $1 trillion companies*, REUTERS (January 31, 2020), reuters.com/article/us-visa-mastercard-stocks/swiping-their-way-higher-visa-mastercard-could-be-the-next-1-trillion-companies-idUSKBN1ZU0JA ("Visa holds a 60% share of the credit and debit card market[.]"). *See also* Julija A., *US Credit Card Market Share: Facts and Statistics,* FORTUNLY (November 23, 2021), fortunly.com/articles/credit-card-market-share/.

773. *See, e.g.*, Douglas Karr, *PayPal Market Share Statistics And Its History of Dominating Online Payment Processing*, MARTECH ZONE (Aug. 3, 2020), martech.zone/paypal-statistics-online-payments/.

774. PayPal's overall online market share has been independently estimated at 14 percent. *See* Stephanie Chevalier, *Which form of payment do you use most often for online shopping?*, Statista, statista.com/statistics/448712/online-shopping-payment-method-preference-usa/. *See also* Douglas Karr, *PayPal Market Share Statistics And Its History of Dominating Online Payment Processing*, MARTECH (Aug. 3, 2020), martech.zone/paypal-statistics-online-payments/ ("18% of all e-commerce is processed by PayPal[.]").

775. Kahai et al. at 508.

776. *Id.* at 510 ("The corresponding values of the Lerner index…are 0.29 and 0.13.").

entry price cost margins of 12 percent.[777] Google's price to developers would fall to [redacted] per transaction in such a competitive but-for world, resulting in total savings of [redacted] per transaction relative to the actual world. In Part VI.D below, I estimate that developers would pass on approximately 91.1 percent of these savings to consumers; accordingly, aggregate damages to consumers in the In-App Aftermarket come to [redacted] over the time period from 8/16/2016 through 5/31/2022 for the U.S.[778] As seen above, Google's take rate would fall to [redacted] in this competitive but-for world, which would still afford Google a significant margin on the transactions in the In-App Aftermarket that it retains (Google's price-cost margin would be [redacted], as shown in Row 15 of Table 8 above).

2. Analysis of Similar Platforms Corroborates My Competitive Take Rate In the In-App Aftermarket

333. Following the *Epic v. Apple* ruling that Apple must permit App developers to steer consumers to other payment processing systems, the third-party payment processing firm Paddle announced its pricing structure for Apple's App Store.[779] In addition to providing a suite of merchant services that Apple does not, Paddle offers a ten percent take rate for any transactions under $10, and a five percent take rate plus $0.50 for transactions over this amount. [780] As shown below, if Paddle were to provide the same services to developers on the Play Store at such rates, developers would be unequivocally better off. This includes developers selling low-priced Apps (below $10), as they would pay only a ten percent transaction fee with no fixed component.

TABLE 9: TAKE RATES FOR APPLE APP STORE, THE PLAY STORE, AND PADDLE

	App Store	Play Store	Paddle
Transactions below $10	15-30%	15-30%	10%
Transactions from $10+	15-30%	15-30%	5% + $0.50

Source: *In-App Purchase*, PADDLE, paddle.com/platform/in-app-purchase

334. More generally, it is common practice in digital markets outside of the In-App Aftermarket for entities to contract with outside payment processors. Epic considered an offer for payment processing from Codashop, which has partnered with numerous game developers across Southeast Asia,[781] for fee percentages in the range of [redacted].[782] E-commerce Apps that offer material, non-digital goods or services on Android phones outside the Play Store are not subject to Google's restrictions and use services such as Stripe, PayPal, and Square to process payments. These payment processors charge a materially lower commission to developers than

777. Yang, *supra*, at 1417 ("Alcoa's residual demand elasticity is -8.3382. Then, the corresponding value of the Lerner index is 0.1199…").

778. In the event that proof of pass-through is not necessary under the law, I have been asked to calculate damages based on the full reduction in the take rate in the but-for world. I do so in Part VII.A below.

779. Chance Miller, *Paddle unveils 'first alternative' to Apple's App Store In-App Purchase system following Epic ruling*, 9TO5MAC, (Oct. 7, 2021), 9to5mac.com/2021/10/07/app-store-iap-paddle-system-announcement/.

780. *In-App Purchase*, PADDLE, paddle.com/platform/in-app-purchase.

781. The Paypers, *Coda Payments partners Riot Games for payments services across Southeast Asia,* (May 4, 2020), thepaypers.com/ecommerce/coda-payments-partners-riot-games-for-payments-services-across-southeast-asia--1242106.

782. EPIC_GOOGLE_01747963; EPIC_GOOGLE_01747440.

Google. Table 10 provides a list of several prominent examples of take rates charged by other payment processors. Notably, some payment processors offer "micropayment" fee structures specifically tailored to small-dollar transactions, which charge lower fixed fees, as illustrated in row (1b) below.[783] The take rates shown in Table 10 reflect healthy competition among payment processors and are closer in magnitude to the implied costs associated with payment processing, a key component of the services that Google provides in the In-App Aftermarket.[784]

783. *See, e.g.*, Jason Vissers, *How much does PayPal charge?*, Merchant Maverick (Jul. 8, 2022), merchantmaverick.com/the-complete-guide-to-paypals-fees-rates-and-pricing/ ("PayPal offers its Micropayments plan to certain merchants with an average transaction size under $10…These merchants will pay 4.99% + $0.09 for low-value transactions, with the lower fixed fee more than making up for the higher percentage fee."). *See also* Lisa Gennaro, "Stripe vs PayPal – Which One Is Better? (Pros and Cons)," (June 24, 2022) wpforms.com/stripe-vs-paypal-which-one-is-better/ (listing, for micropayments below $10, Stripe fees of "5% + 10¢" and PayPal fees of "5% + .05¢").

784. As explained in the previous section, my analysis incorporates Google's financial information to account for the possibility that Google incurs additional marginal costs, beyond payment processing. Specifically, I conservatively include all direct costs recorded in GOOG-PLAY-000416245 ([redacted]).

TABLE 10: PAYMENT PROCESSORS AND THEIR TAKE RATES[785]

	Payment Processor	Example Clients	Take Rate
(1a)	PayPal	American Airlines, eBay, Facebook, Spotify	3.49% + $0.49
(1b)	PayPal Business	Businesses with micropayments	4.99% + $0.09
(2)	Stripe	Lyft, Under Armour, Blue Apron, Pinterest	2.9% + $0.30
(3)	Amazon Pay	Zuora, Shopify, BigCommerce, Magento	
(4)	Braintree*	Uber, StubHub, Dropbox, Yelp	2.59% + $0.49
(5)	Square	Shake Shack, Postmates, Craver	2.6% + $0.10; 2.9% + $0.30†
(6)	Clover	Verizon Business	2.3-2.6% + $0.10
(7)	Authorize.net	TRX Cymbals, Prism Kites	2.9% + $0.30
(8)	Vanco	Churches and public schools	2.9% + $0.45; 2.65% + $0.39††
(9)	Fattmerchant	Lens Crafters, Jimmy Johns, Meineke, Maserati	$99 - $199/month + $0.06 - $0.15 per transaction†††
(10)	Adyen	Booking.com, McDonalds, Spotify, Microsoft	€0.10 + 1-5%††††
(11)	Google Pay**	Burger King, Dunkin Donuts, Target, Doordash	2.9%
(12)	Apple Pay	Best Buy, Taco Bell, Walgreens, Kohl's	3.0%

Notes: Take rates are based on fees for credit card usage. * Owned by PayPal. ** Not to be confused with Google Play Billing. † Square charges 2.6% + $0.10 for in-person swipes and 2.9%

785. *Sources*: (1) Drew Strojny, *Stripe vs PayPal: Who should you choose?*, MEMBERFUL (Jan. 10, 2016), memberful.com/blog/stripe-vs-paypal/; Amanda Swan, *Which online stores accept PayPal?*, FINDER (Dec. 28, 2020), finder.com/paypal-store-list ; (1b) Jason Vissers, *How much does PayPal charge?*, Merchant Maverick (Jul. 8, 2022), merchantmaverick.com/the-complete-guide-to-paypals-fees-rates-and-pricing/ ; (2) Drew Strojny, *Stripe vs PayPal: Who should you choose?*, *supra*; Amanda Swan ; Frank Kehl, *How Does Stripe Work? The Complete Guide to Stripe for Business*, MERCHANT MAVERICK (Jun. 28, 2022), merchantmaverick.com/how-does-stripe-work/ ; (3) Amazon Pay, *Innovative Merchant Payment Services for Small to Medium Businesses,* pay.amazon.com/business/small-business; Amazon Pay Sign up, pay.amazon.com/; (4) Braintree, *Pricing*, braintreepayments.com/braintree-pricing; Braintree, *Boost Revenue with a Global Payments Partner,* braintreepayments.com/ ; (5) Square, Payments, squareup.com/us/en/payments/pricing; Square, Payment Platforms, squareup.com/us/en/payments/payment-platform; Square, *Your all-in-one restaurant POS system,* squareup.com/us/en/point-of-sale/restaurants. (6) Shannon Vissers, *The Complete 2022 Clover Pricing Guide* MERCHANT MAVERICK (Aug. 19, 2021), merchantmaverick.com/clover-pos-cost/ (This rate is for point-of-sale

+ $0.30 for online purchases. †† Vanco offers 2.9% + $0.45 with their "Grow" plan (no monthly fee) and 2.65% + $0.39 for their "Thrive" plan ($49 monthly fee). ††† For the "Starter" plan, it costs $99 plus transactional fees running from $0.08 to $0.15; for the "Enterprise" plan, it costs $199 plus transactional fees running from $0.06 to $0.12. Fattmerchant claims this comes out to less than 1.5% for businesses that process more than $80K annually. *See* source below. †††† Adyen charges a fixed €0.10 processing fee plus a variable payment method fee based on the payment method used. *E.g.,* American Express cards in North America are charged 3.3% + $0.10; Mastercard cards are charged an Interchange fee. Interchange fees are 2% on average within the US. *See* www.adyen.com/blog/interchange-fees-explained.

D. Standard Economic Principles Show That Developers Would Pass Through to Consumers at Least a Portion of Any Savings from a Lower Take Rate

335. Google's take rate from developers typically ranges from [redacted] of revenue, with the average at [redacted].[786] In the competitive but-for world, these costs would have been lower. As explained in this section, standard economic models applied to data produced in discovery demonstrate all or almost all U.S. Consumers would have benefitted as a result. I take no position on whether proof of pass-through is necessary under the law.[787]

1. Standard Economics Shows That Prices Depend on Costs

336. One of the most universal principles of economics is that prices depend on costs.[788] Prices rise as marginal costs rise and fall as marginal costs fall. In perfectly competitive markets, firms pass through to buyers 100 percent of marginal cost increases or decreases in the form of correspondingly higher or lower prices.[789] In the absence of perfect competition, or indeed any

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transaction; Clover charges 3.5% + $0.10 for online (keyed in) transactions); Verizon Communications, *Verizon Business offers touchless payment capability with Clover from Fiserv*, GLOBENEWSWIRE (Dec. 10, 2020), globenewswire.com/news-release/2020/12/10/2143226/0/en/Verizon-Business-offers-touchless-payment-capability-with-Clover-from-Fiserv.html/ (7) authorize.net, *Pricing,* authorize.net/sign-up/pricing html; Featured Customers – Autorize net, featuredcustomers.com/vendor/authorizenet/customers. (8) Vanco, *Pricing,* www.vancopayments.com/egiving/pricing; Neal St. Anthony, *Vanco Payment Solutions grows as electronic bridge between churches, charities and their donors*, STAR TRIBUNE (Aug. 31, 2020), startribune.com/vanco-payment-solutions-grows-as-electronic-bridge-between-churches-charities-and-their-donors/572250712/. (9) POSQuote.com, *Fattmerchant vs. Square: Which Payment Processor Is Best?,* posquote.com/review/fattmerchant-vs-square; Stax Payments – Healthcare, staxpayments.com/healthcare/. (10) Adyen, *Pricing,* www.adyen.com/pricing; www.adyen.com/customers. (11) Bankrate, *Guide to Google Pay* (Jan. 14, 2021), www.bankrate.com/finance/credit-cards/android-pay-google-pay-guide/#:~:text=While%20there%20is%20no%20charge,you%20use%20a%20credit%20card.; Google Pay, *For Business,* pay.google.com/about/business/partners/. (12) Mark Jansen, Christian de Looper, and Paula Beaton, *PayPal vs. Google Pay vs. Venmo vs. Cash App vs. Apple Pay Cash*, DIGITAL TRENDS (July 5, 2021), digitaltrends.com/mobile/paypal-vs-google-wallet-vs-venmo-vs-square-cash/; MacRumors, *Apple Pay,* www macrumors.com/roundup/apple-pay/#:~:text=Some%20of%20Apple's%20partners%20include,Bell%2C%20and%207%2D11.

786. *See* Table 8, *supra*, Row 3; *see also* Table 6, *supra*, Row 6.

787. In the event that proof of pass-through is not necessary under the law, I have been asked to calculate damages based on the full reduction in the take rate in the but-for world. I do so in Part VII.A below.

788. *See, e.g.,* MANKIW, Chapter 4; Chapter 13.

789. *Id.* at 272, Figure 1 (showing price = marginal revenue = marginal cost for a competitive firm).

competition, elementary economic principles of profit-maximization still dictate that prices will rise and fall with marginal costs.[790] Even if a firm has market or monopoly power, it will still maximize profits by passing costs to buyers; the fraction passed through depends on the shape of the demand curve (e.g., flat or curved). For example, with a linear demand curve (a downward sloping straight line), even in monopolistic markets, at least half of marginal cost savings are passed through to customers.[791] For nonlinear demand curves, the pass-through rate generally exceeds 50 percent.[792] For a demand curve with a constant elasticity, pass-through exceeds 100 percent.[793]

337. In markets served by competing firms with some degree of market power, such as developers on the Play Store or in the In-App Aftermarket, prices fall as marginal costs decline whenever firms choose price to maximize profit. A firm selling a single product (and thus facing downward-sloping demand) maximizes profit by charging a markup of price over cost equal to the inverse of the elasticity of demand.[794] This inverse elasticity rule can be written:

$$(P - C) / P = 1 / E_D,$$

where P is the price of the product, C is its marginal cost, and E_D is the firm's own-price elasticity of demand, defined as the percentage decrease in quantity demanded generated by a one percent increase in price. As seen above, the greater is C, the higher P must be to balance the equation.[795]

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790. *See, e.g.,* Hausman & Leonard at 708 ("profit maximization by the firm causes it to pass through at least some of the cost savings in terms of a lower price, even if the firm is a monopolist.").

791. *Id.* at 707 ("[S]o long as demand curves have the expected shape, the minimal amount of marginal cost savings passed on by a monopolist in terms of lower price is one-half of the cost savings.").

792. *Id.* at 721-724.

793. Theon van Dijk & Frank Verboven, *Quantification of Damages*, 3 ISSUES IN COMPETITION LAW AND POLICY 2331, 2342 (ABA Section of Antitrust Law 2008) ("When the price elasticity of demand is constant, η=0, and firms find it optimal to keep their percentage price-cost markup constant regardless of the cost conditions. This implies that a cost increase would lead to a higher absolute price cost-margin, which promotes pass-on.").

794. Hausman & Leonard at 713 (equation (5)). *See also* Landes & Posner at 937 (showing the analogous inverse-elasticity markup for a monopolist); Steven Berry, *Estimating Discrete Choice Models of Product Differentiation* 25(2) RAND JOURNAL OF ECONOMICS 242–262 (1994); Gregory Werden & Luke Froeb, *The Antitrust Logit Model For Predicting Unilateral Competitive Effects* 70 ANTITRUST LAW JOURNAL 257 (2002); Aviv Nevo, *Mergers with Differentiated Products: the Case of the Ready-to-Eat Cereal Industry*, 31(3) RAND JOURNAL OF ECONOMICS 395-421 (2000).

795. In my expert report in support of class certification, I derived an alternative form of this equation, written $(P - C^*) / P = 1 / E_D$ to illustrate how an increase in the take rate is analogous to an increase in marginal cost. *See* Singer Class Certification Rpt. ¶¶ 224-25. I understand that in its class certification briefing Google argued that a component of this equation, C* = C/(1-t), meant that a change in take rate would affect developers' marginal costs only in proportion to their existing costs. This argument is without merit. I did not offer this equation as method to calculate pass-through, nor could it be used reliably for this purpose. Among other things, Google ignores that a developer's own-firm demand elasticity, E_D, depends on the supply responses of other developers. The equilibrium pass-through rate must take these responses into account. The logit pass-through rates that I calculate do exactly that, by solving for each developers' optimal price, given what other developers are charging. Consistent with standard economic practice, I then calculate the change in equilibrium prices resulting from a lower take rate by multiplying (1) the change in marginal costs resulting from a lower take rate; by (2) the logit pass-through rate. *See, e.g.,* Sharat Ganapati, Joseph Shapiro, & Reed Walker, *Energy Cost Pass-Through in US Manufacturing: Estimates and Implications for Carbon Taxes* 12(2) AMERICAN ECONOMIC JOURNAL: APPLIED ECONOMICS 303, 311-315 (2020) (illustrating how prices increase as a result of an upward shift in the marginal cost curve, with the shift equal to the change in average variable costs resulting from a change in the tax rate).

338. [redacted].

2. U.S. Consumers Would Have Benefitted from Developers' Substantially Lower Costs through Various Economic Mechanisms

339. U.S. Consumers would have benefitted from developers' lower costs in several ways. *First*, standard economics shows that Google's take rate influences a developer's initial decision regarding pricing for paid Apps (and the pricing of any In-App Content) when the developer first enters the market (or when the developer first introduces new In-App Content). A developer faced with the prospect of paying up to 30 percent of its revenue to Google in perpetuity, all else equal, will need to charge a higher price to consumers than a developer facing a lower take rate. A developer's decision to enter and remain in the market depends on its ability to both cover its explicit costs and to earn a competitive rate of return. The greater the take rate, the higher the developer's price will need to be in order to do so.[799] For example, Adrian Ong of Match.com testified in *Epic v. Apple* that, [redacted].[800] In addition, the price that

796. *See, e.g.,* MANKIW, *supra*, at 273-277.

797. *Id*. at 250-251; 279-284.

798. *Id*.

799. *See, e.g.,* Margaret Harding McGill, *Exclusive: ProtonMail wades into U.S. antitrust war*, AXIOS (July 22, 2021), axios.com/2021/07/22/proton-swiss-privacy-app-us-antitrust ("At the top of Proton's list of grievances is the 30% commission Apple collects on subscriptions sold through its App Store, with Google planning to enforce the same fee (although Google recently announced a temporary extension to 2022). Proton's "freemium" model means it relies on paid subscriptions for revenue. The company raised prices for consumers to cover the Apple fee, and is facing the prospect of doing the same when Google enforces its fee. "As a small company, there is no way we can afford to just absorb those fees," Miseviciute said. "So we are forced to raise the subscription prices for our consumers."). *See also* Deposition of Adrian Ong, *Epic v. Apple* (February 24, 2021) at 76:9-77:5 [redacted]").

800. Ong Dep. 33:24-34:7. *See also Id.* at 24:23-25:4 ("[redacted]

the developer can charge to consumers will depend on the prices charged by competing developers: All else equal, a developer can charge a higher price when its competitors do the same—and competitors will charge higher prices when the take rate, and thus their costs, are higher.

340. *Second*, as explained above, standard economics shows that prices depend on costs; profit maximization dictates that decreased costs are passed through (at least partially) in the form of lower prices. In the competitive but-for world, developers' costs would have been substantially and permanently lower relative to the actual world. This, in turn, would have resulted in substantially and permanently lower prices paid by consumers. When South Korean developers were forced to comply with the Aftermarket Tie-In, prices for In-App Content reportedly increased by 15 to 20 percent.[801]

341. *Third*, developers would face clear economic incentives to engage in steering in a competitive but-for world with more than one distribution channel by sharing a portion of the cost savings from a lower take rate with consumers who download Apps or In-App Content from a lower-cost platform. Prices for paid Apps and In-App Content are set by the developer. If a developer is charged a lower commission by one supplier relative to another, the developer can incentivize consumers to use the lower-cost supplier if the developer adjusts downward prices to consumers through the lower-cost source. This adjustment will steer customers to the favored supplier. In response, Google would be incentivized to lower its commissions from developers to prevent steering away from Google Play Billing (as well as from the Play Store in the Android App Distribution Market).

342. One possible mechanism for steering is illustrated by the Ultimatum Game, described originally by economist and Nobel laureate John Harsanyi in 1961.[802] Consider a setting in which a developer stands to save $1 in "service fees" per transaction if its customer elects to transact on a lower-cost platform than the Play Store for Apps or transacts through a payment processor other than Google Play Billing for In-App Content. To induce the consumer to select the lower-cost alternative, the developer must decide how much of the dollar to share with the consumer in the form of a reduced price for Apps or In-App Content. If the developer is not sufficiently generous with the amount offered, the consumer will continue to transact with Google, depriving the developer of any savings.

343. Google's documents [redacted].[803] The slide below illustrates [redacted]

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would result in lower prices for customers. Roughly, it costs less than 5 percent, you know, to manage payments, refunds, all of that. If you look at PayPal, it's under 2 percent to use PayPal. And the App Store, in-App payments, PayPal is an option there, so I'm not sure why we're paying 30 percent when it costs us less than 2 percent to use exactly the same payment method.") (emphasis added). Mr. Ong is Senior Vice President of operations of Match Group. *Id. at* 9:24-25.

801. *See* Mansoor Hameed, *South Korean users file police complaint against Google CEO Sundar Pichai*, INDO-ASIAN NEWS SERVICE (June 3, 2022), siasat.com/south-korean-users-file-police-complaint-against-google-ceo-sundar-pichai-2341259/.

802. John Harsanyi, *On the Rationality Postulates underlying the Theory of Cooperative Games,* 5(2) JOURNAL OF CONFLICT RESOLUTION 179–196 (1961).

803. *See e.g.,* GOOG-PLAY-006829073.R at -085.R ([redacted].

[redacted]

FIGURE 19: SLIDE FROM PROJECT BASECAMP

[redacted]

Source: GOOG-PLAY-006829073.R at -085.R.

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344. The first number in the [redacted] column above displays [redacted]

804. If a developer does not use an alternative payment processor, Google's take rate remains at 30 percent. The developer can therefore lower its total take rate if the unbundled take rate (paid to Google) *plus* the cost of a third-party payment processor is below 30 percent. The lower the unbundled take rate, the easier it will be for a developer to construct such a bundle.

[redacted]

345. *Fourth*, even if one assumes that some developers would not lower their prices in the competitive but-for world, consumers still would benefit from quality improvements in Apps and In-App Content that developers would be able finance out of monies saved from lower take rates. Standard economics shows that competition drives firms to make competitive investments in product quality to keep pace with rivals.[805]

3. Statistical Analysis Using Standard Economic Models Confirms Widespread Pass-Through in a Competitive But-For World

346. In this section, I apply standard econometric models to data produced in discovery to estimate the extent to which developers would have passed lower costs (that is, lower take rates) to consumers in the form of lower prices in a competitive but-for world without Google's restrictions. My empirical analysis suggests very high pass-through rates among developers (on the order of 91 percent).

347. Using standard multiple-regression methods, I have econometrically estimated demand curves encompassing initial App downloads and purchases of In-App Content. In each regression,[806] demand for a given App (or form of In-App Content) is modeled as a function of the price of that App (or the price of the In-App Content). All of the regressions include fixed effects.[807] Each fixed effect is unique to a given App, to subproduct(s) within the App if (any),[808] the user's state of residence, and to a purchase type for each transaction. Google's data presents three purchase types (initial downloads, in-app, and subscription). Thus, the regressions control for App-specific characteristics, as well as for differences in the demand for initial downloads of a given App, versus the demand for in-App purchases within that same App. The regressions also include fixed effects by year, which control for shifts in demand over time.

348. I use the standard logit demand system ("logit") to estimate the pass-through rate for each developer. Economists have frequently used logit to analyze a variety of economic phenomena, including (but not limited to) potentially anticompetitive conduct in markets with

805. Kenneth Arrow, *Economic Welfare and the Allocation of Resources to Invention*, *in* THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS, EDITED BY UNIVERSITIES- NATIONAL BUREAU COMMITTEE FOR ECONOMIC RESEARCH AND THE COMMITTEE ON ECONOMIC GROWTH OF THE SOCIAL SCIENCE RESEARCH COUNCILS 467– 92 (Princeton University Press 1962).

806. Department of Justice & Federal Trade Commission, *Horizontal Merger Guidelines* (2010), §10.

807. *See, e.g.,* JEFFREY WOOLDRIDGE, INTRODUCTORY ECONOMETRICS: A MODERN APPROACH, (THOMPSON 4TH ED. 2009), Chapter 14.1 [hereafter WOOLDRIDGE].

808. For example, the Pandora App has multiple subproducts, including Pandora Plus and Pandora Premium.

differentiated products.[809] In a logit demand system, each product within the system has its own (nonlinear) demand curve, given by the following formula:[810]

$$\ln(S_j / S_0) = \delta_j + \alpha P_j$$

809. *See, e.g.* Gregory Werden & Luke Froeb, *The Effects of Mergers in Differentiated Products Industries: Logit Demand and Merger Policy* 10(2) JOURNAL OF LAW, ECONOMICS, & ORGANIZATION 407, 419 (1994) (Former DOJ economist Gregory Werden demonstrates how to use the logit model to analyze the extent to which higher prices resulting from mergers among long-distance carriers would be offset by lower costs being passed on to long distance customers: "we consider the possibility that the cost advantages of large firms can be extended through merger. Table 8 presents the calculated price and welfare effects under that assumption, using the simple logit model."). As the authors explain, "the logit model has direct policy relevance, since the 1992 Horizontal Merger Guidelines use it as the base case for the analysis of mergers in differentiated products industries." *Id.* at 408. Dr. Werden received a Lifetime Service Award from the DOJ, recognizing "his outstanding contributions to the enforcement of the antitrust laws throughout four decades of service." *See* justice.gov/atr/division-operations/division-update-spring-2019/attorney-general-honors-economist-dr-gregory-j-werden. *See also* Luke Froeb et al., *Economics at the Antitrust Division: 2017–2018*, 53 REVIEW OF INDUSTRIAL ORGANIZATION 637, 639-642 (2018) (explaining that logit is one of the primary models included in the antitrust software package developed by DOJ economists Charles Taragin and Michael Sandfort). *See also* Nathan Miller, Marc Remer, Conor Ryan, & Gloria Sheu, *Pass-Through and the Prediction of Merger Price Effects*, 64(4) THE JOURNAL OF INDUSTRIAL ECONOMICS 683, 684-685 (2016) (explaining logit is "commonly employed in antitrust analyses of mergers involving differentiated products."). *Id.* at 705 ("multinomial logit demand [is] the basic workhorse model of the discrete choice literature.") *See also* Jonas Bjornerstedt & Frank Verboven, *Merger simulation with nested logit demand*, 14(3) STATA JOURNAL 511 (2014) (Detailing how to implement merger simulations using logit models in STATA, a leading econometric software package). *Id.* at 530 ("The set of merger simulation commands can be used to simulate the effects of horizontal mergers in a standard setting (differentiated products, multiproduct Bertrand price setting). One can also incorporate various extensions, including efficiencies in the form of cost savings…"). *Id.* at 527-528 (post-merger prices resulting from an auto merger are computed using a nested logit model after accounting for pass-through of marginal cost savings; the results show "that the 20% cost savings are sufficiently passed to consumers.") *See also* Frank Verboven, *International price discrimination in the European car market*, 27(2) RAND JOURNAL OF ECONOMICS 240 (1996) (using a nested logit model to analyze European auto pricing). *See also* Frank Verboven & Theon Vandijk, *Cartel Damages Claims And The Passing-On Defense*, JOURNAL OF INDUSTRIAL ECONOMICS 457, 468 (2009) (using logit to analyze the extent to which direct purchasers overcharged by the European Vitamins Cartel would pass on the overcharges to indirect purchasers. When introducing the logit model, the authors explain that "the logit model…has been popular in many areas of antitrust analysis."). *See also* Kenneth Train, *Logit, in* DISCRETE CHOICE METHODS WITH SIMULATION, 34 (Cambridge University Press 2009) (Professor Train of MIT devotes an entire chapter of his textbook to the logit model, explaining that logit is "by far…the most widely used discrete choice model[.]"). *See also* David Besanko, Sachin Gupta, & Dipak Jain, *Logit Demand Estimation Under Competitive Pricing Behavior: An Equilibrium Framework*, 44 MANAGEMENT SCIENCE 1533 (1998) ("The logit model of consumer choice has now become a standard tool for estimating the impact of marketing mix variables, such as price and sales promotions, on consumer brand choice."). Google's own class certification economist, Dr. Michelle M. Burtis, conceded that logit is "frequently used in economics[.]" Expert Report of Dr. Michelle M. Burtis dated March 31, 2022 ("Burtis Class Report") ¶306.

810. Academic economists sometimes use "random coefficient" logit models (or "mixed logit" models). In practice, these techniques suffer from well-known computational problems, which can severely limit their applicability and accuracy when applied to real-world data sets. *See*, *e.g.* Christopher Knittel & Konstantinos Metaxoglou, *Estimation Of Random-Coefficient Demand Models: Two Empiricists' Perspective* 96(1) REVIEW OF ECONOMICS AND STATISTICS 34 (2014) ("We document the numerical challenges we experienced estimating random-coefficient demand models as in Berry, Levinsohn, and Pakes (1995) using two well-known data sets and a thorough optimization design. The optimization algorithms often converge at points where the first-and second-order optimality conditions fail. There are also cases of convergence at local optima.").

Above, S_j is the share of product j, and S_0 is the share of the outside good—that is, the proportion of consumers that do not purchase any of the products at issue.[811] The term δ_j represents factors other than price that shift demand (and thus share). These are modeled as fixed effects unique to a given App and purchase type (Initial Downloads, In-App, and Subscription).[812] The model also includes fixed effects by state, and for sub-products within a given App (e.g., Pandora Plus versus Pandora Premium).[813]

349. My regressions are structured around 33 App categories used by Google, developers, and consumers.[814] More than [redacted] of the Apps are assigned to just one category in Google's Transaction Data.[815] Using the Play Store's categories makes economic sense because they reflect economically reasonable groupings of consumer tastes for different varieties of Apps, as recognized by a range of industry participants, including Google. According to Google, "Categories and tags help users to search for and discover the most relevant Apps in the Play Store."[816] Record evidence indicates that Google [redacted]. For example, a July 2017 consumer survey was designed [redacted]"[817] [redacted].[818] [redacted]

811. Record evidence indicates that no more than three percent of users make purchases of In-App Content or initial downloads in a given month; this provides one possible estimate of the share of the outside good. GOOG-PLAY-000559379 at GOOG-PLAY-000559380 ([redacted] As explained below, because the pass-through rate in the logit model increases with the share of the outside good, I conservatively set it to zero for purposes of my pass-through calculations.

812. *See, e.g.,* WOOLDRIDGE, Chapter 14.1.

813. The fixed effects are interactive; for example, there is a different fixed effect for Pandora Plus purchased by a customer in California versus Pandora Plus purchased by a customer in Texas.

814. In 2016, Google modified and expanded the categories available through the Play Store. In the process, the "Transportation" category was renamed "Maps & Navigation," and the "Media & Video" category was renamed "Video Players & Editors." Therefore, I have classified Apps formerly under the "Transportation" category under the "Maps & Navigation" category, and I have classified Apps formerly under the "Media & Video" category under the "Video Players & Editors" category. *See* Android Authority, *Google Play to add new App categories to make finding them easier* (July 27, 2016), androidauthority.com/google-play-store-new-app-categories-706028/; Sarah Karam, *Introducing new App categories -- From Art to Autos to Dating -- to help users better find your Apps*, ANDROID DEVELOPERS BLOG (July 26, 2016), android-developers.googleblog.com/2016/07/introducing-new-app-categories-from-art.html.

815. Less than [redacted] of all App titles are classified into multiple App categories in Google's Transaction Data. An even smaller proportion—[redacted]—are classified into multiple App categories at the same point in time. In these rare cases, I assigned the App to the category in which it was most frequently transacted. This ensures that, for purposes of my analysis, each App title is associated with a single category.

816. Play Console Help, *Choose a category and tags for your App or game,* support.google.com/googleplay/android-developer/answer/9859673?hl=en#zippy=%2CApps%2Cgames (listing each of the Play Store's categories, with a description of each).

817. GOOG-PLAY-000294117.R at GOOG-PLAY-000294118.R (emphasis added). The survey, [redacted]

818. GOOG-PLAY-000076773 at GOOG-PLAY-000076785 [redacted]); GOOG-PLAY-000076766 ([redacted]).

[redacted].[819] Google recognized in its 2016 Plan for [redacted]."[820]

350. The Play Store's categories are also used by industry analysts.[821] Developers, who presumably know their customers best, use Google's categories to sell their Apps in competition with other developers; they have clear incentives to select a meaningful category to maximize the value of their Apps.[822] If the developer of a "Parenting" App misclassified their App into the "Auto & Vehicles" category, that developer's ability to compete would likely be compromised. The evidence also shows that the Play Store's categories are economically meaningful to consumers, given their prominent display within the Play Store and given that consumers can filter the Apps displayed to them based on the Play Store categories.[823] Apple's App Store uses a similar set of categories, as seen below:

819. GOOG-PLAY-000579868.R at GOOG-PLAY-000579870.R, GOOG-PLAY-000579878.R.

820. GOOG-PLAY-000303918.R at GOOG-PLAY-000303926.R, GOOG-PLAY-000303930.R.

821. *See, e.g.,* David Curry, *App Data Report,* BUSINESS OF APPS (2022) at 10 (chart showing Google Play categories by volume); *see also* SENSOR TOWER, *2021 – 2025 Mobile Market Forecast,* (2021) at 39, go.sensortower.com/rs/351-RWH-315/images/Sensor-Tower-2021-2025-Market-Forecast.pdf (showing projected consumer spending for top categories, including Games, Social, Entertainment, Comics, Productivity, and Health & Fitness); STATISTA, *Most popular Google Play App categories as of 1st quarter 2021, by share of available Apps,* https://www.statista.com/statistics/279286/google-play-android-app-categories

822. Play Console Help, Choose a category and tags for your App or game, *supra* ("**Choose a category and tags for your App or game** You can choose a category and add tags to your App or game in Play Console. Categories and tags help users to search for and discover the most relevant Apps in the Play Store. Users can view Apps by using a browser and the Google Play app.") (emphasis in original).

823. *See* Google Play Store, *Apps,* https://play.google.com/store/Apps (click on drop-down menu).

TABLE 11: COMPARISON OF PLAY STORE AND APP STORE CATEGORIES

Play Store Category Name	**App Store Category Name**
Art and Design	Graphics and Design
Auto & Vehicles	N/A
Beauty	Lifestyle
Books & Reference	Books/Reference
Business	Business
Comics	Books
Communications	Social Networking
Dating	Social Networking
Education	Education
Entertainment	Entertainment
Events	Entertainment
Finance	Finance
Food and Drink	Food and Drink
Games	Games
Health and Fitness	Health and Fitness
House & Home	Lifestyle
Library & Demo	N/A
Lifestyle	Lifestyle
Maps & Navigation	Navigation
Medical	Medical
Music and Audio	Music
News and Magazines	Magazines & Newspapers/News
Parenting	Lifestyle
Personalization	Graphics & Design/Utilities
Photography	Photo and Video
Productivity	Productivity
Shopping	Shopping
Social	Social Networking
Sports	Sports
Tools	Utilities/Developer Tools
Travel & Local	Travel
Video Players & Editors	Photo and Video
Weather	Weather

351. Although the logit demand system incorporates market shares, it bears emphasis that these need not be shares of a relevant antitrust product market. As DOJ economist Gregory Werden has observed, the market used in a logit demand system "may be more or less inclusive than a relevant antitrust market."[824] The logit demand model also does not imply that all products in the market are perfectly interchangeable, but instead allows for product differentiation.[825] Products that are more attractive to most consumers (and thus have higher market shares) command more pricing power than less-attractive products with lower market shares.[826] As detailed below, what the logit demand system does imply is that developers in a given category pass through cost savings according to their dominance (or lack thereof) in the category, as measured by their market share within that category. For example, if Microsoft, which sells both Word and Excel, dominates the productivity category with its Microsoft 365 package (formerly known as Office, a bundle of Word, Excel, and PowerPoint), Microsoft is predicted to pass through a smaller portion of any cost reduction, all things equal. It is reasonable to assume that Microsoft 365 is a substitute for Google's bundle of productivity Apps called Google Workspace. Both Microsoft 365 and Google Workspace are included in Google's "Productivity" category.

352. Although there is no requirement that the market share for the logit demand model be computed in a relevant antitrust market, it bears noting that antitrust has recognized "cluster markets," in which the market is comprised of items that are not always substitutes. As antitrust scholar Herbert Hovenkamp has noted, cluster markets have aggregated products as diverse as office supplies.[827] In a cluster market, a hypothetical monopolist over (say) paperclips, staples, paper, and other office supplies can profitably raise prices above competitive levels, given that many customers are likely to purchase many or all of their office supplies from the same source. By the same logic, a hypothetical monopolist over games ranging from "Thomas and Friends" to "Poker – Texas Hold'em" could also likely wield monopoly power, given that many households likely "need or at least prefer the convenience of"[828] purchasing games for all members of the family from the same source.

353. In Table 12 below, I econometrically estimate logit demand systems using standard ordinary least squares ("OLS") regressions[829] using the Google Transaction Data. In addition, I used standard instrumental-variable ("IV") regressions to correct for endogeneity.[830] In the IV

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824. Gregory Werden & Luke Froeb, *The Antitrust Logit Model For Predicting Unilateral Competitive Effects* 70 ANTITRUST LAW JOURNAL 257 (2002). Economists make use of market shares in industries that may not perfectly correspond to an antitrust product market. *See, e.g.*, José Azar, Ioana Marinescu & Marshall Steinbaum, *Labor Market Concentration*, 57(3) JOURNAL OF HUMAN RESOURCES (2020) (finding that variation in wages could be explained by measures of labor market concentration within an occupational code using vacancy shares from CareerBuilder.com).

825. Gregory Werden & Luke Froeb, *The Effects of Mergers in Differentiated Products Industries: Logit Demand and Merger Policy* 10(2) JOURNAL OF LAW, ECONOMICS, & ORGANIZATION 407, 408 (1994) ("the logit model has direct policy relevance, since the 1992 Horizontal Merger Guidelines use it as the base case for the analysis of mergers in differentiated products industries.").

826. *Id.* at 410 (equation (3) shows that the own price elasticity for a given product (ε_j) decreases with the market share (π_j)).

827. Hovenkamp, *Digital Cluster Markets, supra* at 276 ("In the *Staples* merger case, the court defined a cluster market…The expert concluded 'that a *monopoly* provider of consumable office supplies would charge significantly more to large customers than Staples and Office Depot today charge these same customers.'").

828. *Id.* at 253.

829. WOOLDRIDGE, *supra*, Chapter 3.

830. Instrumental variables techniques are used to identify the demand curve separately from the supply curve. *Id.* Chapter 15.

regressions, taxes are used as an exogenous instrument that shifts price independently of other demand drivers.[831]

354. I estimate logit demand systems for each of the categories used by Google.[832] Consistent with economic expectations, the regression results confirm a negative and highly statistically significant relationship between demand and price. For example, in Table 12 below, the coefficient on price in the first row of Column (1) is –0.0270, and it is highly statistically significant, with a *p*-value of 0.000. Accordingly, a one dollar increase in price leads to a 2.70 percent decrease in share within the "Art & Design" category.[833] Column (2) shows how the regression output changes after I correct for price endogeneity using an instrument variables (IV) approach. According to the first row of Column (2), a one dollar increase in price leads to a 2.43 percent decrease in share within the "Art & Design" category. This result is also highly statistically significant. For all categories, both the OLS results and the IV results are consistent with economic expectations, in that the coefficient on price is both negative and statistically significant. As summarized by the *R*-squared statistics below, the logit demand systems explain approximately 95 percent of the variation in the category shares.

831. Taxes are used as instrumental variables because they directly affect price but are uncorrelated with other demand shifters. *Id.*

832. In these regressions, the share of the outside good is calculated on a category-specific basis. For example, the share of the outside good for the "Art & Design" category is equal to the share of the market that either (1) made purchases in any of the other categories; or (2) did not purchase at all.

833. This represents a percent change, as opposed to percentage points.

TABLE 12:
ECONOMETRIC ESTIMATES OF LOGIT DEMAND SYSTEMS BY PLAY STORE CATEGORY

App Category	(1) OLS Price Coefficient	(2) IV Price Coefficient
Art & Design	-0.0270***	-0.0243***
	(0.000)	(0.000)
Auto & Vehicles	-0.0289***	-0.0198***
	(0.000)	(0.000)
Beauty	-0.0397***	-0.0323***
	(0.000)	(0.000)
Books & Ref	-0.0436***	-0.0299***
	(0.000)	(0.000)
Business	-0.0217***	-0.0190***
	(0.000)	(0.000)
Comics	-0.0366***	-0.0277***
	(0.000)	(0.000)
Communication	-0.0189***	-0.0149***
	(0.000)	(0.000)
Dating	-0.0385***	-0.0275***
	(0.000)	(0.000)
Education	-0.0303***	-0.0260***
	(0.000)	(0.000)
Entertainment	-0.0429***	-0.0355***
	(0.000)	(0.000)
Events	-0.0392***	-0.0336***
	(0.000)	(0.000)
Finance	-0.0107***	-0.00911***
	(0.000)	(0.000)
Food & Drink	-0.0257***	-0.0223***
	(0.000)	(0.000)
Game	-0.121***	-0.0353***
	(0.000)	(0.000)
Health & Fitness	-0.0302***	-0.0266***
	(0.000)	(0.000)
House & Home	-0.0516***	-0.0362***
	(0.000)	(0.000)
Library & Demo	-0.0131***	-0.00840***
	(0.000)	(0.000)
Lifestyle	-0.0183***	-0.0152***
	(0.000)	(0.000)
Maps & Nav	-0.0195***	-0.0161***
	(0.000)	(0.000)

App Category	(1) OLS Price Coefficient	(2) IV Price Coefficient
Medical	-0.0284***	-0.0244***
	(0.000)	(0.000)
Music & Audio	-0.0367***	-0.0321***
	(0.000)	(0.000)
News & Mag	-0.0109***	-0.00916***
	(0.000)	(0.000)
Parenting	-0.0548***	-0.0492***
	(0.000)	(0.000)
Personalization	-0.0293***	-0.0254***
	(0.000)	(0.000)
Photography	-0.0533***	-0.0481***
	(0.000)	(0.000)
Productivity	-0.0346***	-0.0290***
	(0.000)	(0.000)
Shopping	-0.0658***	-0.0475***
	(0.000)	(0.000)
Social	-0.0616***	-0.0364***
	(0.000)	(0.000)
Sports	-0.0184***	-0.0135***
	(0.000)	(0.000)
Tools	-0.0406***	-0.0372***
	(0.000)	(0.000)
Travel & Local	-0.0490***	-0.0356***
	(0.000)	(0.000)
Video Players	-0.0408***	-0.0363***
	(0.000)	(0.000)
Weather	-0.0391***	-0.0287***
	(0.000)	(0.000)
Includes FE?	[redacted]	
Number of FE		
Observations		
R-Squared		

Notes: *p*-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Each column reports the logit price coefficient corresponding to a given Play store category. Coefficient estimates calculated using a single, fully-interacted regression model allowing coefficients to vary across the 33 Play Store categories. Fixed effects are unique to App name, App subproduct, purchase type (App sale, In-App purchase, subscription), customer state, App category, and year.

355. In Appendix 7, I perform a similar analysis within the "Games" category, subdividing the category into seventeen subcategories of Games used by Google and developers.[834] As before, the price coefficients are negative and highly statistically significant. The logit demand system explains approximately 90% of the variation in the Game subcategories.

356. The standard logit model is widely used by economists to estimate pass-through in a range of contexts. One common application arises in analyzing a proposed merger: Firms seeking approval for a merger often claim that any upward pricing pressure resulting from the merger will be offset by merger-driven cost savings that will be passed on to consumers. Economists use the logit model to analyze the extent to which cost savings would actually be passed through to consumers by the merging firms.[835] Economists also use logit to analyze pass-through outside the merger context, including (but not limited to): (1) analyzing pass-through of higher prices resulting from a cartel,[836] (2) analyzing how wholesale prices are passed on to retail prices;[837] and (3) analyzing the economic effects of price discrimination.[838]

357. The procedure used to calculate the logit pass-through rate depends on the conduct at issue. In a 2009 study, economists Frank Verboven and Theon van Dijk derived pass-through rates for cost increases faced by individual firms in their study of the European Vitamins Cartel, instead of applying a common cost increase to all purchasers from the cartel.[839] As the authors explain, "In a variety of settings it is not appropriate to assume that the cartel leads to a cost increase common to all firms in the plaintiff's industry…"[840] In particular, some members of the vitamins cartel were vertically integrated with downstream producers and may not have been

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834. Unlike the other categories, Google and developers use sub-categories within the Game category. See https://support.google.com/googleplay/android-developer/answer/9859673?hl=en#zippy=%2Cgames

835. *See, e.g.,* Gregory Werden & Luke Froeb, *The Effects of Mergers in Differentiated Products Industries: Logit Demand and Merger Policy* 10(2) JOURNAL OF LAW, ECONOMICS, & ORGANIZATION 407, 419 (1994) ("[W]e consider the possibility that the cost advantages of large firms can be extended through merger. Table 8 presents the calculated price and welfare effects under that assumption, using the simple logit model."). *See also* Johan Stennek & Frank Verboven, *Merger Control and Enterprise Competitiveness: Empirical Analysis and Policy Recommendations*, in FABIENNE IIZKOVITZ & RODERICK MEIKLEJOHN, EUROPEAN MERGER CONTROL: DO WE NEED AN EFFICIENCY DEFENCE? 256 (Edward Elgar Publishing 2006) (using "the popular logit model…to illustrate how to measure pass-on.") *See also* Nathan Miller, Marc Remer, Conor Ryan, & Gloria Sheu, *Pass-Through and the Prediction of Merger Price Effects*, 64(4) THE JOURNAL OF INDUSTRIAL ECONOMICS 683-709, 693 (2016) (Table 1 shows pass-through estimates for logit. The median industry-wide pass-through estimate is 0.95 for logit, meaning that 95 percent of a change in marginal cost is passed on to consumers).

836. Frank Verboven & Theon Vandijk, *Cartel Damages Claims And The Passing-On Defense*, THE JOURNAL OF INDUSTRIAL ECONOMICS 457 (2009) (using logit to analyze the extent to which direct purchasers overcharged by the European Vitamins Cartel would pass on the overcharges to indirect purchasers).

837. K. Sudhir, *Structural Analysis of Manufacturer Pricing in the Presence of a Strategic Retailer* 20(3) MARKETING SCIENCE 244-264 (2001) (using logit to analyze pass-through of wholesale supermarket prices into retail prices paid by consumers). *See also* David Besanko, Jean-Pierre Dubé & Sachin Gupta, *Own-Brand and Cross-Brand Retail Pass-Through*, MARKETING SCIENCE 123, 127 (2005) (Table 1 summarizes logit pass-through rates derived in Sudhir (2001), *supra,* and for Besanko, Gupta & Jain (1998), *supra*).

838. Simon Cowan, *Third-Degree Price Discrimination and Consumer Surplus* 60(2) JOURNAL OF INDUSTRIAL ECONOMICS 333-345 (2012).

839. Verboven & Vandijk (2009) at 488 (calculating pass-through rates as the effect of "a cost increase by firm *i* on prices", and "effect of a cost increase of firm *i* on the industry price index").

840. Verboven & Vandijk (2009) at 469-470.

willing to overcharge companies that they owned.[841] Verboven and van Dijk demonstrated mathematically that the logit pass-through rates for individual firms turn entirely on market shares.[842]

358. More recently, the economists Nathan Miller, Marc Remer, and Gloria Sheu ("Miller et. al.") derived a general model of industrywide cost pass-through.[843] Within that general framework, Miller et. al. also derived pass-through formulae specific to logit.[844] These formulae show how profit-maximizing firms facing logit demand curves optimally respond to an industrywide change in costs. Given that the Challenged Conduct increased take rates for all developers, this is the most appropriate pass-through formula for this case. Miller et. al. demonstrate mathematically that, when firms are subjected to an industrywide change in costs, the profit-maximizing change in the price of a particular product i in response to a one dollar change in a firm's marginal cost is equal to $[M - Q_i]/M$, where M is the size of the category—inclusive of the outside good—and Q_i is the quantity sold of product i.[845] This means that, when demand is logit, a developer's pass-through rate can be estimated as one minus that developer's category share, consistent with what has been shown previously in the peer-reviewed economics literature.[846]

359. To see why the logit pass through rate can be estimated as one minus the developer's category share, note first that equation (1) in Miller et. al. determines firm i's profit maximizing price, written as $f_i(P)$. Equation (2) in Miller et. al. analyzes how $f_i(P)$ changes in response to an industrywide change in cost.[847] Miller et. al. define the pass-through rate as $\partial P/\partial t$.

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841. Verboven & Vandijk (2009) at 482 ("Two premixers are vertically integrated with vitamin producers and may therefore not have been affected.")

842. Verboven & Vandijk (2009) at 488.

843. Nathan Miller, Marc Remer, & Gloria Sheu, *Using cost pass-through to calibrate demand*, 118 ECONOMICS LETTERS 451, 452 (2013).

844. *Id.* at 452-453.

845. *Id.*

846. Professor Cowan of Oxford derived a similar (albeit more limited) result in a paper published in 2012, which analyzed the pass-through rate for a monopolist facing a logit demand curve (whereas Miller et. al. derived more general formulae applicable to industries with heterogeneous competing firms). *See* Simon Cowan, *Third-Degree Price Discrimination and Consumer Surplus* 40(2) JOURNAL OF INDUSTRIAL ECONOMICS 333, 335 (2012) ("For the logit demand function pass-through is 1 - q*"). Under Prof. Cowan's notation, q* is the monopolist's market share. *Id.* at 344 (Appendix One: Logit Demand). Professor Sudhir of Yale also derived a similar (albeit more limited) result in an article published in 2001. Prof. Sudhir restricted his analysis to a single retailer (whereas Miller et. al. derived more general, industrywide formulae). *See,* K. Sudhir, *Structural Analysis of Manufacturer Pricing in the Presence of a Strategic Retailer* 20(3) MARKETING SCIENCE 244-264 (2001) (using logit to analyze pass-through of wholesale supermarket prices into retail prices paid by consumers). *Id.* at 251, equation (12) (with logit demand, a profit-maximizing retailer will, in response to a change in the wholesale price for a given product, adjust the retail price of that product by an amount proportional to $(1 - S_I)$, where S_I is the share of the product in question.

847. Economists recognize that, in the case of ad valorem costs (that is, costs that are expressed as a percentage of revenue, such as a percentage tax), the industrywide change in costs is calculated based on the change in average variable costs resulting from a change in the tax rate (or, in this case, the take rate). That is the approach I adopt here. *See, e.g.,* Sharat Ganapati, Joseph S. Shapiro, & Reed Walker, *Energy Cost Pass-Through in US Manufacturing: Estimates and Implications for Carbon Taxes* 12(2) AMERICAN ECONOMIC JOURNAL: APPLIED ECONOMICS 303, 311-315 (2020).

Equation (2) shows that $\partial P/\partial t$ is equal to $\partial f(P)/\partial P$, multiplied by negative one and inverted.[848] Equation (6) of Miller et. al. shows that, for logit demand: $\partial f_i(P)/\partial P_i = -M/[M - Q_i]$, where M is the category size and Q_i is the quantity of product i. Based on equation (2), the logit pass-through rate is obtained by multiplying the right-hand side of equation (6) by negative one and inverting it, which yields $[M - Q_j]/M$.[849] This gives the amount by which firm i will increase its price in response to each one dollar increase in cost. For example, suppose that developer i accounts for 30 percent of the category. This means that $Q_i/M = 0.30$. Firm i's pass-through rate is $[M - Q_i]/M = M/M - Q_i/M = 1 - Q_i/M = 1 - 0.3 = 0.7$. Thus, in this example, for each one-dollar increase (decrease) in its own costs, the firm will optimally raise (lower) its price by $0.70.[850]

360. In Table 13 below, I apply the pass-through formulae from Miller et. al. to calculate pass-through rates for each Play Store category. Each row of Table 13 displays the ratio of the dollar change in a developer's profit-maximizing price resulting from a one-dollar change in marginal cost. As seen below, the logit demand system yields an overall pass-through rate of 91.1 percent. This estimate is calculated as the weighted average across all categories, with each category receiving a weight proportional to the quantity of transactions in that category. (Thus, the "Game" category receives more weight than others). Similarly, the pass-through rates for each category are calculated as the weighted average pass-through rate for all Apps in the category. Thus, larger Apps receive more weight than smaller Apps.[851]

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848. Both $\partial f(P)/\partial P$ and $\partial P/\partial t$ are matrixes of equal size. The number of rows in each matrix is equal to the number of firms in the market. The number of columns in each matrix is equal to the number of products in the market. For example, if there are two firms, each selling one product, both $\partial f(P)/\partial P$ and $\partial P/\partial t$ will be 2 x 2 matrixes.

849. This calculation conservatively ignores cross-price effects by setting the off-diagonal elements of the matrix $\partial P/\partial t$ to zero. If cross-price effects are considered, the logit pass-through rate exceeds the (1 – *Share*) formula described herein.

850. All else equal, the larger is the share of the outside good (S_0), the larger is M, and the larger is the pass-through rate. Because the pass-through rate increases with the share of the outside good, I conservatively set S_0 equal to zero for purposes of calculating pass-through using the logit demand system. In addition, I aggregate purchase quantities by developer.

851. In the Play Store, the "Tinder" App is categorized under the "Lifestyle" category, just as it is in the Apple App Store. *See* Google Play, https://play.google.com/store/Apps/details?id=com.tinder&hl=en_US&gl=US; Apple App Store Preview https://Apps.apple.com/us/app/tinder-dating-new-people/id547702041. In the alternative, I have been asked to recalculate Tinder's pass-through rate after recategorizing it into the "Dating" category. When I do so, Tinder's estimated pass-through rate changes from [redacted] to [redacted]

TABLE 13: PASS-THROUGH RATES BY CATEGORY

App Category	Pass-Through Rate
ALL	**91.1%**
ART_AND_DESIGN	66.9%
AUTO_AND_VEHICLES	81.9%
BEAUTY	43.9%
BOOKS_AND_REFERENCE	84.7%
BUSINESS	84.6%
COMICS	59.5%
COMMUNICATION	87.9%
DATING	81.4%
EDUCATION	91.9%
ENTERTAINMENT	84.9%
EVENTS	47.4%
FINANCE	74.1%
FOOD_AND_DRINK	80.6%
GAME	93.8%
HEALTH_AND_FITNESS	94.4%
HOUSE_AND_HOME	70.5%
LIBRARIES_AND_DEMO	58.9%
LIFESTYLE	65.5%
MAPS_AND_NAVIGATION	83.9%
MEDICAL	92.8%
MUSIC_AND_AUDIO	41.4%
NEWS_AND_MAGAZINES	87.7%
PARENTING	84.6%
PERSONALIZATION	87.3%
PHOTOGRAPHY	92.0%
PRODUCTIVITY	83.8%
SHOPPING	41.3%
SOCIAL	88.6%
SPORTS	79.9%
TOOLS	96.3%
TRAVEL_AND_LOCAL	88.2%
VIDEO_PLAYERS	86.1%
WEATHER	80.0%

361. In summary, I estimate that developers' profit-maximizing response to a one dollar decrease in costs would be to decrease their prices to consumers by approximately $0.91. This price decrease is profit-maximizing because the marginal benefit to developers of lowering the

price in the competitive but-for world—increasing the demand for Apps or In-App Content—exceeds the marginal cost of meeting the increased demand. If developers were to reduce their prices by less, their profit in the competitive world would be lower.

362. In Appendix 7, I perform a similar analysis within the "Games" category, estimating a different pass-through rate for each of the Game subcategories used in the Play Store. The weighted average pass-through rate across all of the Game subcategories is 79.1 percent. The pass-through rates for the Game subcategories range from 52.3 percent (Educational) to 95.5 percent (Role Playing)]].

363. Consistent with standard economic methods, I use the pass-through rates for the 33 categories to estimate but-for prices by multiplying (1) the change in marginal costs resulting from a lower take rate; by (2) the pass-through rate. To illustrate, suppose a developer charges a price of $10 in the actual world, and that the take rate is 30 percent. If the developer's take rate falls to 15 percent in the but-for world, its marginal cost savings can be conservatively estimated as $10*(0.30 – 0.15) = $1.50.[852] Assume that the developer's pass-through rate is 90 percent. The amount of the cost savings passed on to consumers can be calculated as [$1.50 x 0.90] = $1.35. The but-for price can then be conservatively calculated as $10 - $1.35 = $8.65. Using a more precise calculation, the but-for price can be calculated as $8.43.[853]

4. Analysis of Pass-Through in Alternative Settings Corroborates Developer Pass-Through

364. In this section, I provide evidence and examples of pass-through that support my econometric calculation of the pass-through rate.

V. *Apps That Avoid In-App Aftermarket Restrictions*

365. Historically, some developers using the Play Store, including Netflix, Spotify, and Tinder, have refused to compel their customers to use Google Play Billing for In-App Content by instead redirecting them to a web browser.[854] Some developers allow consumers to transact both within the Google Play Store and Google Play Billing as well as outside of them at a lower price, permitting an apples-to-apples comparison that provides evidence of pass-through. Bookedin, an appointment scheduling software App, points out that it "need[ed] to charge extra to compensate

852. This estimate of marginal cost savings is conservative because the developer's marginal cost savings will be even greater as a result of pass-through. For example, suppose the developer's price falls from $10 to $9 when the take rate falls from 30 percent to 15 percent. The developer's marginal cost savings under this scenario are [$10 x 0.30] - [$9 x 0.15] = $1.65, which exceeds the $1.50 in marginal cost savings calculated above.

853. Continuing the example from the prior footnote, given a 90 percent pass-through rate, the but-for price (P_{bf}) satisfies the equation [$10 - P_{bf}]/ [$10 x 0.3 - P_{bf} x 0.15] = 0.90. Solving this equation for the but-for price yields P_{bf} = $8.43.

854. Ron Amadeo, *Google announces crackdown on in-App billing, aimed at Netflix and Spotify*, ARS TECHNICA (Sept. 20, 2020) ("Today, Netflix and Spotify don't use Google's in-App billing and instead kick new accounts out to a Web browser, where the companies can use PayPal or direct credit card processing to dodge Google's 30-percent fees"); *see also* Kif Leswing, *Google to enforce 30% take from in-App purchases next year*, CNBC (Sept. 28, 2020), www.cnbc.com/2020/09/28/google-to-enforce-30percent-cut-on-in-app-purchases-next-year html; Nick Statt, *Tinder is now bypassing the Play Store on Android to avoid Google's 30 percent cut*, THE VERGE (Jul. 19, 2019), www.theverge.com/2019/7/19/20701256/tinder-google-play-store-android-bypass-30-percent-cut-avoid-self-install.

for additional fees Apple and Google charge Bookedin to sell our App in their store."[855] The price offered on the Bookedin website for its "Pro 1" membership is $24/month vs. $34.99/month for the App sold through the Play Store, offering a 31 percent discount for avoiding Google's 30 percent take rate.[856] Down Dog, a yoga and exercise App, charges $7.99 a month on its website vs. $9.99 for the App purchased through the Google Play Store, implying a discount of 20 percent.[857] Tinder, a popular dating App and the second-highest grossing App on the Google Play Store, has discounted the subscription prices on its website by ten percent, relative to the price of the same subscriptions when purchased within the Play Store.[858] As observed by Jared Sine, Chief Legal Officer of Match Group (the parent company of Tinder), Google's and Apple's commissions amounted to "500 million dollars that could be going back into the pockets of everyday consumers or deployed to hire employees or invest in new innovations."[859]

366. Spotify, a popular music-streaming App, reluctantly allowed consumers to purchase its subscription music service from within Apple's App Store (where it did not negotiate a lower take rate). Spotify was forced to raise the cost of its premium subscription service within the Apple App Store from $9.99 per month to $12.99 per month in 2014.[860] This $3 increase can be understood as Spotify's attempt to roughly equalize its margins between its service through the internet ($9.99) and through the Apple App Store ($12.99).[861] Per Horacio Gutiérrez, Head of Global Affairs and Chief Legal Officer for Spotify: "Spotify could not absorb the IAP [in-App product] tax without raising its prices, because a large component of its costs are the licensing fees paid to record labels and music publishers."[862] Gutiérrez pointed out that "[o]ne doesn't need a Ph.D. in economics to recognize that Apple is hurting consumers by forcing competitors either to charge higher prices or preventing competitors from communicating offers of discounts or other promotional offers."[863] A European Commission investigation into prices charged by music-streaming providers showed that Apple's 30 percent commission rate was typically passed through

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855. Bookedin, *Why are the prices different in App Store/Google Play?* (accessed June 15, 2021), support.bookedin.com/hc/en-us/articles/360028446492-Why-are-the-prices-different-in-App-Store-Google-Play-

856. ($34.99 - $24.00) / ($34.99) ≈ 31 percent.

857. ($9.99 - $7.99) / ($9.99) = ≈ 20 percent.

858. Based on prices observed on the Tinder website versus the prices through the Play Store on an Android device. Tinder Plus costs $9.99/month on the Play Store compared to $8.99/month on Tinder's website, implying a discount of ($9.99 - $8.99) / ($9.99) ≈ 10%. Tinder Gold costs $14.99/month on the Play Store compared to $13.49/month on Tinder's website, implying a discount of ($14.99 - $13.49) / ($14.99) ≈ 10%. Tinder Platinum costs $19.99/month on the Play Store compared to $17.99/month on Tinder's website, implying a discount of ($19.99 - $17.99) / ($19.99) ≈ 10%.

859. Testimony for the S. Judiciary Committee, Subcomm. on Competition Policy, Antitrust, and Consumer Rights, at 2 (Jared Sine, Chief Legal Officer, Match Group, Apr. 21, 2021) [hereafter Sine Testimony].

860. Testimony for the S. Judiciary Committee, Subcomm. on Competition Policy, Antitrust, and Consumer Rights, at 8 (Horacio Gutierrez, Head of Global Affairs and Chief Legal Officer, Spotify, Apr. 21, 2021) [hereafter Gutierrez Testimony].

861. Celena Chong, *Spotify shows its iPhone users how to save $3 by avoiding Apple's App Store*, BUSINESS INSIDER (July 8, 2015), www.businessinsider.com/spotify-shows-users-how-to-save-3-by-avoiding-apple-app-store-2015-7 ("Both Spotify and Apple Music technically charge $9.99 a month, but subscriptions purchased through the iTunes App Store charges a 30 percent fee — causing Spotify to charge $12.99 for its premium service within iTunes to generate the same revenue."). Apple's 30 percent commission would be $3.90 on a price of $12.99. By raising its price by only $3, Spotify was passing through 77 percent ($3/$3.90) of the increase due to the imposition of Apple's take rate.

862. Gutierrez Testimony at n. 13.

863. *Id.* at 9.

in full to consumers.[864] Unlike with Apple, Spotify has been able to circumvent Google's take rate entirely.[865] [redacted][866] Table 14 summarizes the implied pass-through rates for major these major App developers.

864. Statement by Executive Vice-President Margrethe Vestager on the Statement of Objections sent to Apple on App Store rules for music streaming providers (Apr. 30, 2021) ("Our investigation showed that this fee was passed on to end users by raising prices, typically from 9.99 to 12.99 Euros.").

865. *See* Responses and Objections of Non-Party Spotify USA Inc. to Rule 45 Subpoena at 15, *In re Google Play Consumer Antitrust Litigation* (No. 3:20-cv-05761-JD) ("[redacted]"). [redacted].

866. Feng Dep. 292:4-293:9 ([redacted]).

TABLE 14: PRICE COMPARISON OF APPS THROUGH WEBSITE VS. APP STORE

	App	Product	Website Price	App Store Price	Implied Pass-Through Rate*
1	Tinder	Gold Membership	$13.49/month	$14.99/month (Google Play)	33%
2	BookedIn	Professional	$24/month	$34.99/month (Google Play)	105%
3	Down Dog	Unlimited Access to All Down Dog Apps	$7.99/month	$9.99/month (Google Play)	67%
4	Spotify	Premium Subscription Service	$9.99/month	$12.99/month (Apple App Store)	77%
5	Tidal	Premium Subscription Service	$9.99/month	$12.99/month (Apple App Store)	77%
6	YouTube	Subscription Service	[redacted]	[redacted] (Apple App Store)	[redacted]

*Pass-through rate = (App price – website price) / ($ App commission - $ website commission) using an assumed zero percent commission charged on the website. Assuming a zero percent commission on the website is conservative so this estimate reflects a lower bound. The calculations conservatively assume a 30 percent take rate paid by the developer to Google (or Apple). To the extent that a developer pays a lower take rate, that developer's pass-through rate would be understated.

Sources: (1 – Tinder) Publicly advertised price; (2 – BookedIn) Appointment Booking & Online Scheduling Software – Pricing – BookedIn, support.bookedin.com/hc/en-us/articles/360028446492-Why-are-the-prices-different-in-App-Store-Google-Play (3 – Down Dog) Publicly advertised price; (4 – Spotify) Gutierrez Testimony at 8; (5-Tidal) Shahar Ziv, *Here's Why Your Apple App Store Purchases May Be A Ripoff*, FORBES (July 8, 2020), forbes.com/sites/shaharziv/2020/07/08/heres-why-your-apple-app-store-purchases-may-be-a-ripoff/?sh=77c6e9872007 ; (6-YouTube) Feng Dep. Tr. 292:4-293:9, *supra*.

b. Pass-Through of Sales Taxes and Digital Service Taxes

367. Google's take rate is economically analogous to a tax on developers. Elementary economics shows that changes in tax rates shift prices, including the prices paid by consumers for goods or services subject to sales taxes.[867] The imposition of state and local sales taxes on digital goods therefore provides a useful example for understanding pass-through in this case. Apps often serve customers across a number of different local tax jurisdictions. When a digital product is

867. *See, e.g.*, MANKIW, *supra*, at 120-127 (explaining the economics of how consumers share in the tax burden). *Id.* at 124-125 (providing an example explaining how payroll taxes, which are levied as a percentage of earnings, are passed on to workers in the form of lower wages). *See also* Sharat Ganapati, Joseph S. Shapiro, & Reed Walker, *Energy Cost Pass-Through in US Manufacturing: Estimates and Implications for Carbon Taxes* 12(2) AMERICAN ECONOMIC JOURNAL: APPLIED ECONOMICS 303, 311-315 (2020)

subject to a tax, this burden is typically passed through in full to the customer; it is not absorbed by the seller. Indeed, software APIs have been created to facilitate passing through the correct amount of tax based on the local jurisdiction and the product being sold.[868] Economically speaking, this arrangement is tantamount to a commission being imposed on a developer that is fully passed through to the consumer. As summarized by Spotify on its website:

> Some state and local governments may also require us to collect tax (e.g. Sales Tax) if Spotify undergoes marketing/promotional activities in the state or locality, or uses local sales agents or consultants. This fee is included at the point of the transaction, which is why you might see a slightly different price on your receipt to the rate that's advertised.[869]

Examples like this abound: Netflix,[870] Hulu,[871] Amazon,[872] and Google[873] all offer similar disclaimers on their websites regarding local sales taxes. As one press report summarizes, "If you live in one of the nearly 25 states that charge sales tax on digital goods or services you likely pay more for everything from downloaded music, e-books and ringtones to streaming TV shows and video."[874]

368. Economists recognize that taxes, including ad valorem taxes, are passed on to consumers in the form of higher prices.[875] Using Google's transaction data, I have performed standard regression analysis confirming that higher tax rates are systematically passed on to consumers in the form of higher prices for Apps and In-App Content. The dependent variable in

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868. *See, e.g.*, Jennifer Dunn, *Sales Tax by State: Should You Charge Sales Tax on Digital Products?* (Feb. 13, 2018), www.taxjar.com/blog/sales-tax-digital-products ("The TaxJar API allows you to assign a product tax code to the products you sell. If you assign the product tax code for digital goods to the digital products you sell, the TaxJar API automatically charges your customer in any state the right amount of sales tax depending on that state's applicable laws.").

869. Spotify, *Does the price for Premium include tax?,* support.spotify.com/us/article/sales-tax/.

870. Netflix, *Taxes on your Netflix membership,* help.netflix.com/en/node/50068#:~:text=The%20Netflix%20advertised%20price%20does,membership%20includes%20streaming%20and%20games ("The Netflix advertised price does not include sales tax. If sales tax applies, it is stated separately on your monthly invoice").

871. Hulu, *Why was I charged tax?,* help.hulu.com/s/article/charged-sales-tax#:~:text=Why%20was%20I%20charged%20tax%3F&text=In%20certain%20jurisdictions%2C%20Hulu%20is,that%20is%20assessing%20the%20tax ("In certain jurisdictions, Hulu is required to charge tax on our services in order to comply with your state and local laws. This is based on your billing address. When applicable, these taxes are collected by Hulu and are then remitted to the jurisdiction that is assessing the tax.").

872. Amazon, *Help & Customer Service – Tax on Amazon Prime*, www.amazon.com/gp/help/customer/display html?nodeId=202036230 ("If you choose to continue, you'll automatically be charged for Amazon Prime plus any applicable taxes").

873. Google, *Tax rates and value-added tax (VAT) – Play Console Help,* support.google.com/googleplay/android-developer/answer/138000?hl=en ("In accordance with sales tax requirements, Google is responsible for determining, charging, and remitting sales tax for Google Play Store App and in-App purchases by customers in these states. Google will collect and remit sales tax to the appropriate tax authority, as applicable. You don't need to calculate and send sales tax separately for customers in these states. Even if you're not located in the United States, this treatment will still apply.").

874. Melanie Hicken, *Are you paying the iTunes tax?*, CNN MONEY (June 5, 2013), money.cnn.com/2013/06/05/pf/taxes/itunes-tax/.

875. *See, e.g.,* N. GREGORY MANKIW, PRINCIPLES OF MICROECONOMICS 124-125 (Cengage Learning 8th ed. 2018) (explaining that payroll taxes, which are levied as a percentage of earnings, are passed on to workers in the form of lower wages). *See also* Simon Anderson, André de Palma, & Brent Kreider, *Tax Incidence in Differentiated Product Oligopoly* 81(2) JOURNAL OF PUBLIC ECONOMICS (2001) 173-192.

this regression is the natural logarithm of the price paid by the consumer, and the key independent variable is the tax rate. For example, the regression in column (1) shows that a one percentage-point increase in the tax rate increases the consumer price by approximately 1.1 percent, and the relationship is highly statistically significant.[876] Thus, an increase in the ad valorem tax rate implies an increase in the price paid by the customer. This provides particularly relevant direct evidence of pass-through because the Play Store's take rate is economically analogous to a tax.

TABLE 15: HIGHER TAX RATES PREDICT HIGHER PRICES

	(1)	**(2)**
Dependent Variable:	*ln(P)*	*ln(P)*
Tax Rate	[redacted]	
Constant		
Includes FE?		
Number of FE		
Observations		
R-Squared		

p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Tax rates expressed as percentages. Fixed effects in column (2) are unique to App name, App subproduct, purchase type (App sale, In-App purchase, subscription), customer state, App category, and year. Fixed effects in column (1) are the same, except that they are not year-specific.

5. Google's Limited Take Rate Reductions In The Actual World Do Not Provide A Reliable Estimate of Marketwide Pass-Through In A More Competitive But-For World

369. In a more competitive but-for world, all or almost all developers would enjoy substantially and permanently lower take rates. In a competitive world with more than one App store or payment processor, developers would be incentivized to pass on savings from a lower take rate via steering and discounting, to induce consumers to switch to the low-cost provider. In a competitive but-for world, this would be facilitated by (1) multi-homing and steering among competing App stores in the Android App Distribution Market; and (2) consumer (or developer) choice of payment processors with steering in the In-App Aftermarket.[877] These incentives are absent in the actual world. Developers that enjoyed Google's limited take-rate decreases in the

876. For example, suppose that the price of an App is initially $2.00. The regression predicts that, if the tax rate increases by one percentage point, the price that the consumer pays for the App will increase by approximately 1.1 percent, from $2.00 to $2.02.

877. Singer Class Cert Report ¶¶169-175; ¶¶229-232. Record evidence indicates that [redacted]. *See, e.g.* GOOG-PLAY-011072319 at -319—320 ([redacted]).

actual world did not have to share any of the savings with their customers in order to realize the cost savings.

370. "Price "stickiness," which arises due to well-understood behavioral economic phenomena such as consumer anchoring,[878] would tend to limit pass-through in the actual world, while facilitating lower prices in the but-for world.[879] When a new App (or a new form of In-App Content) is developed, a profit-maximizing developer selects a price that maximizes expected profit over the long run, taking into account costs incurred over the long run.[880] To ensure a sufficient rate of return on its investment, a developer faced with the prospect of paying 30 percent of its revenue to Google in perpetuity will (all else equal) need to charge a higher price to consumers than a developer facing a lower take rate. Price stickiness implies that the initial price chosen for an App (or In-App Content) will influence subsequent pricing, and hence reinforces developers' incentives to select an initial price that takes all costs (including the take rate) into account. Because developer costs would have been permanently and substantially lower due to lower take rates, prices would have been permanently and substantially lower for all or almost all developers.[881] Thus, lower take rates would influence developer pricing from the inception of their Apps (or In-App Content).

E. Google Could Also Respond to Greater Competition By Increasing Its Customer Discounts Such as Play Points

371. In this Part, I demonstrate impact and damages using the Discount Model. The two-sided model for the Android App Distribution Market and the one-sided model for the In-App Aftermarket were used to determine competitive but-for take rates under the assumption that the locus of competition, absent the Challenged Conduct, would be on take rates. For example, the two-sided platform model assumes that Google's access charge to consumers was near zero (and actually negative) in both the actual and competitive but-for worlds. An alternative, plausible response to the elimination of Google's restrictions would be for Google to increase its loyalty points program for consumers to encourage their use of the Play Store and Google Play Billing rather than using any other competing source of Apps or In-App Content. An increase in Google's loyalty points would have the effect of reducing prices for purchases of Apps and In-App Content, without any requirement that developers steer consumers via discounting. Indeed, this form of

878. *See, e.g.,* Amos Tversky & Daniel Kahneman, *Judgment under Uncertainty: Heuristics and Biases*, 184 SCIENCE 1124, 1128 (1974) ("In many situations, people make estimates by starting from an initial value that is adjusted to yield the final answer…different starting points yield different estimates, which are biased toward the initial values. We call this phenomenon anchoring."). *See also*, Andrea Caceres-Santamaria, *The Anchoring Effect*, Federal Reserve Bank of St. Louis (2021), https://research.stlouisfed.org/publications/page1-econ/2021/04/01/the-anchoring-effect ("[I]t's the initial price a consumer is exposed to that becomes a consistent reference point when shopping around. The tendency for a person to rely heavily on the first piece of information they receive when making decisions is known as the anchoring effect…Anchoring plays a role in decisions that involve numerical values such as prices…Retailers are very aware that price anchors are an effective tool they can use in their pricing strategy.").

879. Singer Class Cert Report ¶¶226-227.

880. *Id*. ¶226.

881. Even if one assumes that some developers would not lower their prices in the competitive but-for world, consumers still would benefit from quality improvements in Apps and In-App Content that developers would be able finance due to lower costs from lower take rates. Standard economics shows that competition drives firms to make competitive investments in product quality to keep pace with rivals. *Id*. ¶233 (citing Department of Justice & Federal Trade Commission, *Horizontal Merger Guidelines* (2010), §10).

competition is how credit cards compete to retain customers (funded via interchange fees to merchants), and how global distribution systems compete to retain travel agents (funded by booking fees charged to airlines). In addition to serving as a means to compete for consumers, a subsidy to consumers by Google can also bring value to developers by encouraging consumer spending.[882]

372. Record evidence indicates that Google recognizes that the issuance (as opposed to the redemption) of Play Points confers value to the consumer. Google recognizes that, as a result of Play Points, "[redacted]"[883] Google considers Play Points to be "[redacted]".[884] Google has likened Play Points to "[redacted]"[885]

373. Given the current lack of competition due to the Challenged Conduct, the size and scope of Google's Play Points program is fairly modest. Android users who signed up pre-2019 must opt in to Google Play Points.[886] In addition, not all Apps participated in Google Play Points.[887] According to one analyst, under the current configuration of the program, "the spend-to-earn ratio is so steep that you would have to spend a pretty unrealistic amount of money in the Google Play Store to get enough points to actually do anything."[888] Despite its modest size relative to Google's take rate, the structure of Play Points is a reasonable facsimile of what an expanded program might look like in a competitive but-for world. Google awards Play Points for: (1) any purchase; (2) participation in weekly promotions (essentially getting extra points for spending on particular top games); and (3) installing new Apps that Google selects.[889] The points can then be spent on (a) Play credits (money to buy games); (b) priced initial App downloads or In-App Content; or (c) discounts on In-App Content.[890] Consumers may also reach higher "tiers" as they accrue points, which gives them access to additional benefits.[891] More broadly, Google could adopt other methods (akin to Amazon Coins) for providing direct consumer discounts.

374. Record evidence reveals that Google [redacted] Lawrence Koh, former Global Head of Games Business Development at Google, testified that Google launched [redacted][892] Google first introduced Play Points in

882. GOOG-PLAY-002653782.R at -792.R [redacted]").
883. GOOG-PLAY-001557975 at -986.
884. *Id.* at -980 [redacted]").
885. *Id.* at -977.
886. Jonathan Jaehnig, *What Are Google Play Points and How Can You Use Them?*, MAKE USE OF (Apr. 8, 2021), www.makeuseof.com/what-are-google-play-points/.
887. *Id.*
888. *Id.*
889. GOOG-PLAY-000518034.R. at -038.R.
890. *Id.*
891. *Id.* at -041.R.
892. Koh Dep. 353:1-18.

Japan, when it faced competition from Amazon.[893] Google noted that [redacted] "[894] It further noted that "[redacted]."[895]

375. Even under the limited competition that exists in the actual world, Google targeted more than just HVUs (high value users) with Play Points, and encouraged broad-based participation: "[redacted]."[896]

376. Record evidence indicates that uptake and usage of Play Points [redacted]. When Google launched Play Points in Japan, Google documents show that "[redacted].[897] Moreover, Google "[redacted][898]

377. Google next deployed the Play Points program in response to the ONE Store's entry in Korea. The ONE Store offered "cashback events," which amount to 30 to 50 percent of total transactions inside certain gaming Apps,[899] making points (rather than the take rate) the locus of competition. Google planned to [redacted].[900] Google also noted that Samsung, through its Galaxy App store, was "[redacted]"[901] In response to this dual threat in South Korea,[902] Google enhanced its own points program, launching in April 2019 and enrolling "[redacted]h.[903] By the end of 2020, Google was offering a Play Points subsidy worth approximately [redacted] of consumer spend in South Korea.[904] These examples

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893. Google introduced its Play Points program in Japan in September 2018. *See* C. Scott Brown, *Google Play Points rewards program is real and in Japan right now,* ANDROID AUTHORITY (Sept. 18. 2018), www.androidauthority.com/google-play-points-rewards-905387/.

894. GOOG-PLAY-001284083.R at -086.R. A "churn rate" tells how many customers a company loses over a time period in percentage terms. The risk that a company will lose customers can be referred to as "churn risk." *See* Patrick Icasas, *Your Customer is a Churn Risk (And Here's How We Know),* Catalyst (July 12, 2021), *available at* catalyst.io/blog/your-customer-is-a-churn-risk-and-heres-how-we-know.

895. GOOG-PLAY-001284083.R at -086.R. Google also noted that [redacted]." GOOG-PLAY-000879194.R at -195.R.

896. GOOG-PLAY-000436278.R at -287.R.

897. GOOG-PLAY-000004957.R at -969.R.

898. *Id.*

899. *See* Kim Jung-Min & Chea Sarah, *One Store Gains Ground in Local Android App Market*, KOREA JOONANG DAILY (Dec. 2, 2020), koreajoongangdaily.joins.com/2020/12/02/business/industry/One-Store-app-market-Google/20201202175300439.html.

900. *Id*. at -437.R.

901. *Id*. at GOOG-PLAY-000953437.R.

902. GOOG-PLAY-000302766.R at -864.R ([redacted]).

903. GOOG-PLAY-000518034.R at -045.R

904. GOOG-PLAY-002653782.R at -793.R. *See also* GOOG-PLAY-005708308.R.

indicate that Google could respond to the elimination of its anti-competitive restrictions with incentives and discounts to consumers.

378. In the United States, Google's Play Points program was more widely introduced alongside Project Hug as part of a larger effort to combat the threat of platform competition. In a document, Google strategized about what to do with Supercell/Tencent, a holdout on Project Hug.[905] Tencent wanted a reduced take rate in addition to the other incentives Google was offering.[906] Google [redacted].

379. Further, Google initially ceded to mobile carriers [redacted] to fend off platform competition. This suggests that Google would be willing to cede as much to consumers to fend off competition in a but-for world without Google's anticompetitive restrictions.

380. Even under the limited competition that exists the actual world, Play Points have no expiration date as long as a consumer remains active: "[redacted]"[908]

381. Google's Class Certification expert, Dr. Burtis, has argued that my Discount Model fails "to consider that Google's Play Points program provides benefits to a relatively small percentage of U.S. consumers,"[909] as "[redacted] of U.S. consumers participated in the program and [redacted] of U.S. consumers earned and redeemed Play Points."[910] That "only" [redacted] U.S. consumers participated in Play Points in the actual world—when the benefits of Play Points are comparatively meager—is hardly evidence that participation in a more competitive but-for world would not be substantially greater. In addition, that "only" [redacted] of those who participated earned and redeemed Play Points in the actual world does not prove that a more generous program would not see more widespread redemptions. Consumers would have enhanced economic incentives to enroll and participate in a Play Points offering more valuable incentives in the but-for world, just as consumers have more incentives to participate in a more generous credit card rewards program than a less generous one. In a more competitive but-for world, Google would also be incentivized to facilitate consumer participation in Play Points or

905. GOOG-PLAY-007329029.
906. *Id.*
907. *Id.* at -030.
908. GOOG-PLAY-007861322 at -329. *See also* Google Play, *Google Play Points Terms of Service* (Nov. 1, 2019), https://play.google.com/about/points-terms/index.html.
909. Burtis Class Cert Report ¶358.
910. *Id.*
911. Equal to [redacted]

other direct consumer discounts. For example, consumers could be automatically enrolled in Play Points. Discounts could be automatically redeemed at the point of purchase or even dispensed through a "cash-back" program.[912]

382. It is also incorrect to assume that Play Points that are not redeemed have no value. *First*, Play Points that have not yet been redeemed today may still be redeemed in the future—in other words, they have an intrinsic option value, just as cash accumulating in a jar can be spent later. *Second*, that different consumers may value Play Points differently does not make them worthless. That different consumers may place different values on reward points, gift cards, or even money does not imply that they lack economic value.

383. As explained in Part VI.B.5.c, Amazon has offered substantial consumer subsidies through initiatives such as Amazon Coins. Record evidence indicates that [redacted] of worldwide consumer expenditure in the Amazon Appstore is transacted using Amazon Coins.[913] This provides evidence that Play Points subsidies would be widely utilized in a more competitive but-for world.

384. To model the effect of an increased subsidy to consumers in a competitive but-for world, I once again use the Rochet-Tirole two-sided platform model. However, I now solve for a negative transaction price or subsidy to consumers in response to platform competition, assuming that the but-for take rate remains fixed at its observed average value of [redacted]. Under the current program, Google's Play Points can be applied to both initial App downloads and purchases of In-App Content—that is, Google does not have two different point programs.[914] It is reasonable to assume the structure of the program would remain the same in a competitive world, albeit with a larger subsidy for consumers, as Google would want to incentivize users to continue purchasing through its platform. Accordingly, I estimate the model only once to obtain a single subsidy in both markets as Google offers now. In contrast, above I estimated the competitive but-for take rate in the Android App Distribution Market separately from the competitive but-for take rate in the In-App Aftermarket, as nothing requires Google to charge the same take rate in those separate markets. My use of the Rochet-Tirole model to estimate a competitive but-for subsidy that can be spent on initial paid App downloads or In-App Content should not be taken to mean that the In-App Aftermarket is a two-sided antitrust market nor that the two separate antitrust markets are suddenly unified. Put differently, that I use the two-sided model to estimate a *single* consumer subsidy across both initial paid App downloads and purchases of In-App Content—a subsidy model that Google uses today and might use in a competitive but-for world—has no bearing on whether the In-App Aftermarket is one-sided or two-sided.

385. Holding the take rate fixed at the observed monopoly level, a monopoly platform operator would maximize its profits by setting the buyer-side platform price P_B such that the following equation is satisfied:

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912. *See, e.g.,* Discover, Discover it Cash Back Card, https://www.discover.com/credit-cards/cash-back/it-card.html

913. AMZ-GP_00002484, at 2488 ("[redacted].")

914. For this reason, the model can be applied whether there is one market, or whether there is a separate aftermarket.

(V.11) $$\frac{P_B + tS - C}{S + P_B} = \frac{1}{\varepsilon_B}$$

where ε_B is the price elasticity of demand from buyers for paid App downloads or In-App Content.[915] In the presence of competition, the platform operator would maximize profits with respect to its residual demand curve (market demand net of demand that is competed away by rivals), yielding the competitive analogous expression:

(V.12) $$\frac{P_B + tS - C}{S + P_B} = \frac{1}{\varepsilon_{OB}}$$

where ε_{OB} is the own-brand price elasticity of demand from buyers for paid App downloads or In-App Content. [916]

386. My sources and methods for obtaining the monopoly scenario inputs shown in Equation (V.11) are:

- P_B^M is equal to the price "charged" by Google to consumers for each transaction made on its platform in the monopoly scenario. Through its Play Point loyalty program and other promotions, Google effectively charges a small negative price to consumers. I compute the average value of this subsidy as the sum of all promotions paid by Google for transactions made in both the Android App Distribution Market and In-App Aftermarket, divided by the total quantity of paid Apps downloaded in the Android App Distribution Market and purchases of In-App Content in the In-App Aftermarket, as observed in Google's transaction records.

- t is equal to the observed take rate, computed as the sum of all revenue retained by Google in both the Android App Distribution Market and In-App Aftermarket divided by the sum of total revenue spent by consumers in both the Android App Distribution Market and In-App Aftermarket (prior to Google's promotional expenditures, which are captured by P_B^M).

- S is equal to the average price charged for paid Apps in the Android App Distribution Market and In-App Content in the In-App Aftermarket in the monopoly setting.[917] I calculate S as the total amount of revenue spent by consumers (prior to receiving promotions from Google) in both the Android App Distribution Market and In-App Aftermarket divided by the total quantity of paid Apps downloaded in the Android App Distribution Market and purchases of In-App Content in the In-App Aftermarket, as observed in Google's transaction records.

- Marginal cost C represents the incremental cost incurred by Google of executing a transaction in the Android App Distribution Market or In-App Aftermarket. I refer to

915. Details of how Equation (V.11) is derived are provided in Appendix 3.
916. Details of how Equation (V.12) is derived are provided in Appendix 3.
917. Apps that are free to download and free In-App content have a zero price and are therefore excluded from the analysis.

Google's financial data to infer this value, which suggests that transaction fees, customer support, and other fees are equal to [redacted] of consumer expenditures.[918]

- ε_B^M is the buyer-side price elasticity of demand for paid Apps in the Android App Distribution Market and In-App Content in the In-App Aftermarket. ε_B^M reflects the change in the quantity demanded by consumers for Android App Distribution Market or In-App Aftermarket transactions associated with a change in the price of the App or in-App product $S^M + P_B^M$ (inclusive of the buyer-side platform price).[919] Given the other inputs to the monopoly model, the value of ε_B^M is implied by Equation (V.11).

I hold C fixed across the monopoly and competitive scenarios. Because I am modeling competition on the buyer-side consumer price, I hold the developer-side take rate t fixed between scenarios also. Holding t fixed implies no change in the (pre-subsidy) product price S between scenarios. My sources and methods for obtaining the remaining inputs to the competitive scenario expression shown in Equation (V.12) are:

- P_B^C is the competitive buyer-side price charged by Google for each transaction on its platform. Using the other inputs to the model, Equation (V.12) allows me to solve for P_B^C.

- ε_{OB}^C is the "own-brand" price elasticity of demand for paid Apps in the Android App Distribution Market and In-App Content in the In-App Aftermarket by consumers in the presence of competition. ε_{OB}^C reflects the change in the quantity demanded from consumers for Android App Distribution Market and In-App Aftermarket transactions—from Google in particular, hence, "own-brand"—associated with a change in App prices. Relative to its monopolistic analogue, this parameter reflects a scenario where Google faces competition from rival platforms; as such, the parameter will be greater in magnitude, because the presence of platform competition allows easier defection from consumers in the presence of a product price increase. I draw from the economics literature empirical evidence of industries that have shifted from monopoly to competition. I conservatively estimate that the buyer-side price elasticity of demand faced by Google shifts from a value of [redacted] (in the monopoly setting, as calculated using Equation (V.11)) to [redacted] in the competitive setting. I arrive at [redacted] using the relation between own-brand elasticity and market demand elasticity under the conservative assumption that Google maintains a 60 percent market share with an inelastic supply response from Google's rivals.[920] Further description of this input is included in Appendix 3.

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918. *See* work papers for this report.

919. ε_B^M (which reflects consumer sensitivity to the total product price including buyer-side platform price, $P_B^M + S^M$) differs from, but is related to, the take rate buyer elasticity $\varepsilon_{B,t}^M$ (which reflects consumer sensitivity to the take rate, effectuated via pass-through) that is referred to in Section V.A.3. Further description of these parameters can be found in Appendix 3.

920. I use the relation $E_g = \frac{E_M}{S_g} + \frac{E_S(1-S_g)}{S_g}$ where E_g is Google's own-brand elasticity (reflecting price responses of both buyers and sellers), E_M is market elasticity, S_g is Google's market share, and E_S is the elasticity of supply of Google's rivals. I conservatively assume Google maintains a 60 percent market share and that $E_S = 0$. This implies that buyer price elasticity of demand changes from [redacted] in the monopoly setting (estimated using Equation (V.11)) to [redacted]. *See, e.g.,* Landes & Posner.

TABLE 16: DISCOUNT MODEL (U.S., 8/16/2016 – 5/31/2022)

Actual World (Monopoly, Eqn. (V.11))				
#	**Input**	**Description**	**Value**	**Source/Notes**
[1]		Consumer Expenditure (US; Before Discounts)	[redacted]	GOOG-PLAY 005535886; Google Transaction Data (US Consumers)
[2]		Google Revenue (US; Before Discounts)		*Id.*
[3]		Google Promotional Expenditures (US)		*Id.*
[4]		Android App Distribution (Paid) and In-App Aftermarket Transactions (US)		*Id.*
[5]=[1]/[4]	S	App Product Price		Calculated
[6]=[2]/[1]	t	Take Rate		Calculated
[7]=-[3]/[4]	P_B^M	Buyer-side Platform Price		Calculated
[8]=[5]+[7]	$S + P^M_B$	App Product Price Net of Discounts		Calculated
[9]	C	Marginal Cost		GOOG-PLAY-000416245; GOOG-PLAY-010801682
[10]	ε^M_B	Buyer Price Elasticity of Demand		Calculated (Eqn. (V.11))
But-For World (Competitive, Eqn. (V.12))				
#	**Input**	**Description**		**Source/Notes**
[11]=[5]	S	App Product Price		Calculated (Eqn. (V.8))
[12]=[6]	t	Take Rate		Calculated
[13]	P_B^C	Buyer-side Platform Price		Calculated (Eqn. (V.12))
[14]=[11]+[13]	$S + P^C_B$	App Product Price Net of Discounts		Calculated
[15]=[9]	C	Marginal Cost		GOOG-PLAY-000416245; GOOG-PLAY-010801682
[16]	ε^C_{OB}	Buyer Own-Price Elasticity of Demand		Economic theory/empirical studies
[17]=[8]-[14]		Consumer Savings Per Transaction		Calculated
[18]=[17]*[4]		**Aggregate Damages**		Calculated

Notes: *See* notes for Table 6, *supra*.

387. Table 16 above summarizes the inputs and resulting buyer-side platform price, and calculates aggregate damages. Table 16 shows calculations made with respect to transactions in both the Android App Distribution Market and the In-App Aftermarket combined; the inputs will therefore vary from those used in Table 6. According to this model, Google would provide a direct consumer discount, either through expanding the Play Points program or by providing a similar economic benefit, worth an average of [redacted] per transaction, or approximately [redacted] of consumer spend (in the competitive but-for world).[921] Because this is a direct subsidy to consumers, there is no need to estimate a pass-through model to establish antitrust impact. As Table 16 shows, the resulting but-for average price of paid App downloads in is [redacted] down from

921. Equal to the [redacted] divided by the product price of [redacted]

the observed price of [redacted] (net of Google's promotional expenditures to consumers). This difference results in an average overcharge to consumers of [redacted],[922] and aggregate damages of [redacted] as a result of the Challenged Conduct for the time period August 16, 2016, through May 31, 2022 for the U.S.

388. In the actual world, Google awards Play Points to members of the program in proportion to their purchases made in the Play Store; any customer can enroll in Play Points free of charge. In the but-for world, awarding Play Points in proportion to all purchases made by U.S. Consumers, including purchases made by members of the Damages Class, implies lower prices in the but-for world relative to the actual world, and therefore common impact on all or virtually all members of the Damages Class.

F. A Rigid Pricing Structure Ensures That U.S. Consumers Would Benefit From The Removal of the Challenged Conduct

389. Google's commission structure affects all paid Apps and purchases of In-App Content by taking a fixed percentage. Moreover, while developers set different prices for their Apps and In-App Content, these differences do not vary by customer. Eliminating the Challenged Conduct would introduce competition driving the commission rate lower or resulting in further subsidies to consumers by enhancing loyalty programs. Enhanced loyalty programs again would not lead to differential prices across different consumers. Both lower commission rates and enhanced loyalty programs would therefore benefit all U.S. Consumers.

390. This is true even when a U.S. Consumer purchases from a developer that has received a discount off Google's standard take rate in the actual world. In the actual world, Google has imposed a headline take rate of 30 percent nearly universally, with the following exceptions: (1) a 15 percent take rate rolled out in 2018 for subscription Apps (initially only for subscribers after their first year; more recently for all subscribers); (2) a 15 percent take rate charged for the first $1 million of sales (starting July 2021); and (3) [redacted] Nevertheless, Google's overall take rate has been at or very close to 30 percent for the vast majority of consumer expenditures: Google's data show that Google has collected commissions in excess of [redacted] of consumer expenditures in both the Android App Distribution Market and the In-App Aftermarket.[923]

391. To the extent that some developers received discounts from Google's 30 percent take rate in the actual world, such discounts would be similarly negotiated in the competitive but-for world.[924] [redacted]."[925] [redacted]

922. Equal to [redacted].

923. *See* Table 6, *supra*, Row 6; *see also* Table 8, *supra*, Row 3.

924. Hal J. Singer and Robert Kulick, *Class Certification in Antitrust Cases: An Economic Framework*, 17 GEORGE MASON LAW REVIEW (2010); Hal Singer, *Economic Evidence of Common Impact for Class Certification in Antitrust Cases: A Two-Step Analysis*, 25(3) ABA'S ANTITRUST (2011).

925. Rosenberg Dep. 123:22-124:23 ([redacted]").

[redacted].[926] In Part VII below, I show how to compute damages for individual U.S. Consumers based on their purchases.

G. Lower Prices Would Enhance Demand for Apps and In-App Content and Lower Take Rates Would Enhance the Supply of Apps and In-App Content Leading To Increased Output Relative to the Actual World

392. A foundational principle in economics is that "demand curves" are downward sloping—meaning that, all else equal, consumers will demand more of a product or service the lower its price.[927] How much more will be demanded depends on the consumer elasticity of the demand response to lower prices for Apps and In-App Content. As developers steer consumers to lower-cost App stores or payment processors in the but-for world via lower prices, consumers would respond by making more paid App downloads and purchases of In-App Content. This phenomenon can be understood graphically as a movement down the demand curve, resulting in higher output.

393. In a similar vein, the supply of Apps and In-App Content would increase as developers receive more for their Apps and In-App Content. Currently, developers receive only approximately [redacted] of the revenues generated from paid Apps and In-App Content in light of Google's take rate. Absent the Challenged Conduct, developers would realize larger proceeds, which would bring forward more App and In-App Content development, commensurate with a shifting out of the supply curve. Indeed, Google recognized that take-rate reductions, leading to higher revenues (price less commission) paid to developers, could increase output: In announcing its reduction in its commission to 15% for the first $1 million in revenue, Google's Vice President of Product Management explained that the new policy would provide "funds that can help developers scale up at a critical phase of their growth by hiring more engineers, adding to their marketing staff, increasing server capacity, and more."[928] When the ONE Store reduced its take rate, it reported substantial increases in both the number of Apps and in transaction volumes.[929]

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926. To illustrate, suppose that Google's overall take rate falls from 30 percent in the actual world to 20 percent in the but-for world. A developer paying a 15 percent take rate in the actual world would pay a take rate of 10 percent in the but-for world (equal to 15*(20/30). This lower take rate would then be passed on to U.S. Consumers in the form of lower prices.

927. *See, e.g.,* GEORGE STIGLER, THE THEORY OF PRICE 23 (McMillan 3rd ed. 1987) ("The 'demand curve' is the geometrical expression of the relationship between quantity purchased and price, and our law of demand says that demand curves have a negative slope.").

928. Sameer Samat (Google Vice President, Product Management), *Boosting Developer Success on Google Play* (Mar. 16, 2021), android-developers.googleblog.com/2021/03/boosting-dev-success html.

929. *See, e.g.,* One Store, *One Store wins by cut fees* (Sep. 5, 2018), onestorecorp.com/news/presskit/2018/2018-09-05 html ("One Store has revealed the two-month interim performance of the announcement of a new App distribution policy, including a 25% cut in fees in July of this year. [CEO] Jaehwan Lee announced that compared to before the policy change, the number of newly registered app/game products increased by about 30% and the total transaction amount increased by 15%.") (English translation by Google Translate). *See also* Korea JoongAng Daily, *One Store gains ground in local Android App market* (Dec. 2, 2020), koreajoongangdaily.joins.com/2020/12/02/business/industry/OneStore-app-market-Google/20201202175300439.html ("Since July 2018, One Store lowered its commission fee to 20 percent from 30

394. There is no reason why the markets for Apps and In-App Content are any different from other markets where demand increases as prices fall. Indeed, my estimated elasticities of demand confirm this relationship. Accordingly, a reduction in the prices to consumers of Apps and In-App Content, which would result from a removal of Google's anti-competitive restrictions in the two relevant antitrust markets, would translate directly into enhanced demand for Apps and In-App Content. Given the digital nature of the products in both markets and thus the largely fixed cost of supplying both products[930]—the initial App and In-App Content—increased demand would translate into additional output for both products.

395. To show the output effect for each year in the Class Period from 2016 through 2022 (the latest available annual data), I begin with the aggregate commissions paid by developers to Google. The average actual take rates on paid downloads in the Android App Distribution Market was [redacted] and the average actual take rates on paid purchases of In-App Content was [redacted]. According to my two-sided market model, the average competitive take rate in the Android App Distribution Market would be [redacted]. According to my economic model, the average competitive take rate in the In-App Aftermarket would be [redacted].

396. These lower take rates translate into lower costs for developers. For example, as seen in Table 8, in the In-App Aftermarket the Play Store's price per transaction to developers would decline from [redacted] in the actual world to [redacted] per transaction in the but-for world, for total savings of [redacted] per transaction. Consumers would also benefit because [redacted] percent of these savings would be passed on in the form of lower prices. Developers and consumers would also benefit from lower costs in the Android App Distribution Market, as seen in Table 6.

397. To convert these price reductions into output effects, I conservatively apply the estimated market price elasticity of [redacted], shown in Table 8. For every one percent decrease in Google's price, demand increases by [redacted] percent. For example, a ten percent decrease in the transaction price would increase transaction demand by [redacted] percent.

398. Because the counterfactual experiment lies at the heart of antitrust analysis,[931] which involves comparing actual output against output but for the Challenged Conduct, output effects can occur even against a background of expanding output in the relevant market.[932] Output effects here take the form of fewer Apps downloaded and fewer purchases of In-App Content than would have otherwise occurred. Because the demand for such goods falls as their prices rise (that

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percent on all in-App purchases. Starting October this year, it has also been offering 50 percent discounts on commission fees for businesses with monthly transactions under 5 million won. Google Korea's recent announcement that it would force a 30 percent commission fee on all in-App purchases is another driving force behind One Store's fast growth. Local App developers who were upset with Google's decision are turning their eyes to One Store as an alternative.").

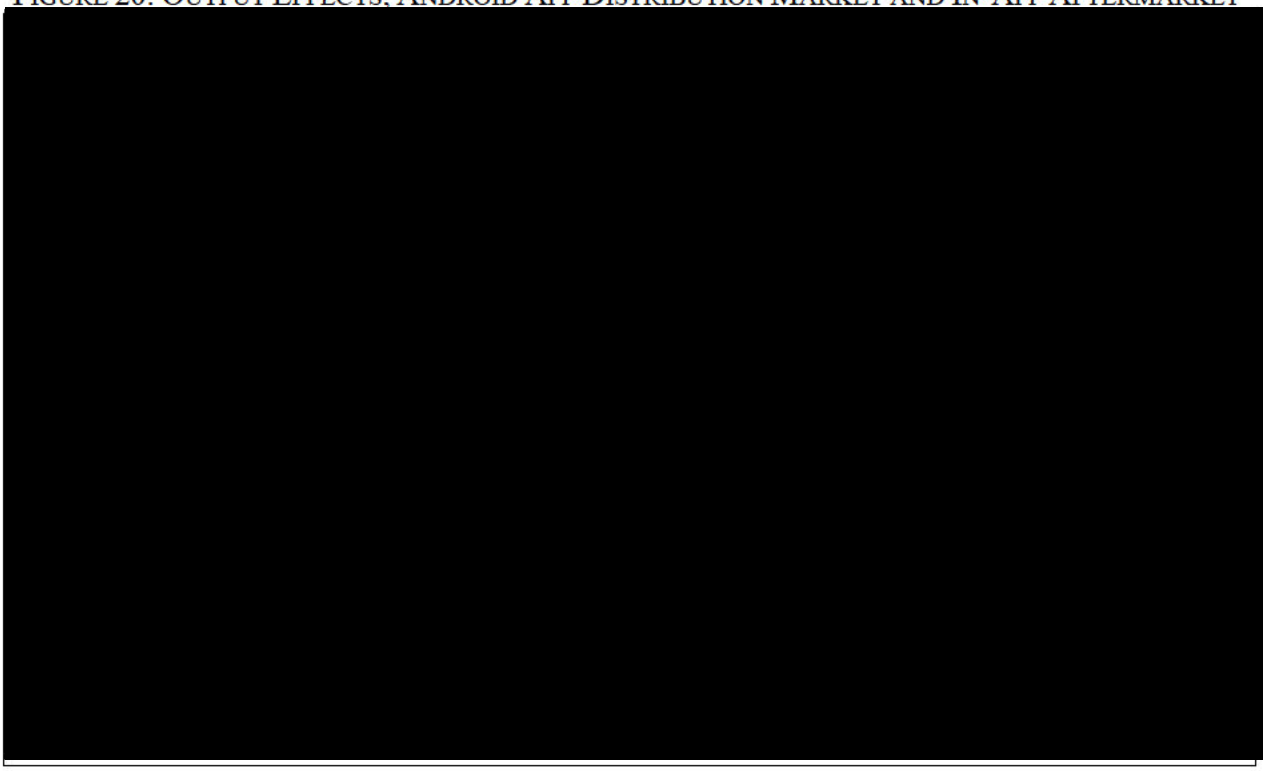
930. The marginal cost is the developers' marginal cost, plus the marginal cost of the record keeping, server hosting, auto updating, security, and authorization services that Google currently performs.

931. Theon van Dijk & Frank Verboven, *Quantification of Damages*, in 3 ISSUES IN COMPETITION LAW AND POLICY 2331, 2332 (ABA Section of Antitrust Law 2008) ("The difference between this counterfactual world and the actual world provides the measurement of damages.").

932. John Newman, *The Output-Welfare Fallacy: A Modern Antitrust Paradox*, 107(2) IOWA L. REV. 563, 579 (2022) (explaining the "The trial court found that AmEx's no-steering rules had increased retail prices for nearly every consumer product sold in the United States (among other ill effects)," implying output effects per the appropriate counterfactual exercise).

is, the demand curves slope downward), it follows that output contracted, even though in the In-App Aftermarket we observe output increasing over the Class Period. In other words, the but-for competitive output curves sit strictly above the actual output curves, illustrated below. This holds true for all of my economic models of a competitive but-for world. Below I conservatively calculate output effects based on the demand elasticity of [redacted] in Table 8. Using this elasticity, output is estimated to increase by approximately [redacted] in the but-for world, as seen below.[933]

FIGURE 20: OUTPUT EFFECTS, ANDROID APP DISTRIBUTION MARKET AND IN-APP AFTERMARKET



Sources: Play Store financials; Google Transaction Data; Tables 6 and 8.

399. In addition to these direct output effects, the but-for world is likely to be characterized by increased innovation by software developers, which would redound to the benefit of consumers in the form of enhancements to quality, quantity, and consumer choice in both the Android App Distribution Market and In-App Aftermarket. For example, lower take rates would allow developers to reinvest to improve their products by "hiring more engineers, adding to their marketing staff, increasing server capacity, and more," just as Google recognized in launching its reduction in take rate for the first $1 million in developer revenue.[934] Record evidence indicates that Google [redacted]

933. For the App/In-App models, I estimate that output would increase by approximately [redacted] driven by a decrease in the take rate to approximately [redacted] (equal to the weighted average across the Android App Distribution Market and the In-App Aftermarket). For the Discount Model, I estimate that output would increase by approximately [redacted] driven by the increase in consumer discounts. For the Single Take Rate model, I estimate that output would increase by approximately eleven percent, driven by a decrease in the take rate to [redacted] percent. *See* work papers for this report.

934. Sameer Samat (Google Vice President, Product Management), *Boosting Developer Success on Google Play* (Mar. 16, 2021), android-developers.googleblog.com/2021/03/boosting-dev-success.html.

[redacted].”[935] Increased competition would also allow developers to meaningfully improve the quality of their payment solutions. [redacted].”[936]

H. In the Competitive But-For World, Google Would Still Make a Profit from the Play Store

400. Eliminating Google’s anticompetitive restraints would allow developers to use alternative App stores and be free from the first download onward to choose a payment processor and other suppliers of services that support the purchase of In-App Content. *Ex ante* competition to be an alternative source of Apps or to become a default payment processor for a developer would result in more competitive take rates. And lower take rates would redound to the benefit of consumers in the form of lower prices, as developers competed for the loyalties of consumers.[937] If Google responded to increased competition by increasing consumer discounts, consumers would benefit directly from the discounts. As explained in the previous section, output would increase in the but-for world. This would serve to partially offset the effects of lower take rate and of the Play Store’s diminished market share. I understand that Mr. Chase has calculated the Play Store’s but-for profit after taking these effects into account, and that his analysis confirms that the Play Store would indeed remain profitable in the but-for world under the App-In/App models, the Discount Model, the Single Take Rate Model, and the Amazon Discount Model.[938]

A. In the Absence of the Challenged Conduct, Google Would Refrain from Imposing a Fee on Consumers for Initial Downloads, Including on Free Apps

401. Because a large user base is critical, two-sided digital platform operators, such as Google, are often incentivized to provide free access to users or even to subsidize access to users.[939] This approach allows two-sided digital platforms to get “both sides on board.” Encouraging use of the platform by one group may come at a cost to the platform operator, but it serves to attract the group on the opposite side of the platform.[940] In the instant setting, allowing consumers to browse

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935. GOOG-PLAY-002358233 at -236.

936. GOOG-PLAY-001088593 at -596.

937. In the face of regulatory pressure, Google recently announced that it will it allow users in South Korea to use different in-App payment options, including in-App payment systems developed by App developers; Google will consequently decrease its take rate by four percentage points (from 15 percent to 11 percent). *See* Nathaniel Mott, *Google Decides to Obey South Korea’s In-App Payment Law*, PCMAG (Nov. 4, 2021), pcmag.com/news/google-decides-to-obey-south-koreas-in-app-payment-law. In the competitive world contemplated here, Google would not be able to impose a take rate on in-App transactions unless Google were selected to be the payment processor by the developer.

938. Expert Report of Michael H. Chase, CPA, CFF, ABV (Oct. 3, 2022), ¶9.

939. *See, e.g.,* Thomas Eisenmann, Geoffrey Parker, and Marshall W. Van Alstyne, *Strategies for Two-Sided Markets*, HARVARD BUSINESS REVIEW 3-4, (2006) (“Because the number of subsidy-side users is crucial to developing strong network effects, the platform provider sets prices for that side below the level it would charge if it viewed the subsidy-side as an independent market.”). *See also* Mark Armstrong & Julian Wright, *Two-sided markets, competitive bottlenecks and exclusive contracts*, 32 ECONOMIC THEORY 353-380, 359 (2007) (“If attracting one group (say buyers) makes the platform particularly attractive to the other group (say sellers), then buyers will be ‘subsidized.’”).

940. Rochet & Tirole at 991 (2003).

the Play Store for free and download free Apps creates a benefit to Google above the cost to create and maintain the App store due to the indirect network effects in attracting more developers and additional money Google can make by attracting advertisers.[941] Google's network-driven incentive to "capture" as many users as possible by drawing them into the Google ecosystem (including the GMS suite) would not change in the absence of its anticompetitive conduct. Google would continue to benefit from indirect network effects even without its various restrictions—the more Apps it can attract, the more consumers will come to its platform—although its take rates on positively-priced Apps would be lower. However, any reduction in revenue from a lower take rate would be more than offset by the advertising revenue generated from maintaining its user base. Google also would continue to obtain information about users, just as it does from its other Apps in its GMS suite, which Google monetizes through the delivery of targeted ads to users.

402. Accordingly, Google likely would not impose even a modest fee on consumers for downloads of free Apps. Any attempt by Google to impose a transaction fee on consumers for free downloads would run counter to the company's basic business model and history to provide a widening array of free Apps or functionalities—such as Search, Maps, Gmail, You Tube, Chrome, and other Apps in its GMS suite—to consumers, but then collecting and monetizing information from consumers to realize and improve Google's targeted digital advertising. Imposing a fee on initial downloads would discourage consumers from downloading Apps through the Play Store, which in turn would jeopardize advertising revenues from the Play Store. Indeed, in 2020, Google earned [redacted] in the sale of ads that appeared in the Play Store, with almost all of those revenues falling to the bottom line.[942] Having more users on the Play Store lifts Google's advertising revenues above and beyond those earned on the Play Store, as those users are more inclined to remain in an Android environment, supporting other Google Apps. [redacted][943] By imposing a download fee on free Apps, [redacted].[944]

403. Moreover, many Apps may be considered "experiential products,"[945] meaning that a consumer cannot discover its usefulness until they have downloaded the App and explored its functionalities. Imposing a fee on formerly free Apps would undermine this discovery process and thereby lower the value of the Play Store for consumers. Discouraging consumers from installing new Apps would also undermine the indirect network effects that Google is trying to harness—namely, a large customer base that attracts more developers to its platform and generates more

941. Android was founded on this premise. *See* GOOG-PLAY-001055695 at -697 ([redacted]).

942. GOOG-PLAY-001090227.

943. Statista, *Advertising revenue of Google from 2001 to 2021*, statista.com/statistics/266249/advertising-revenue-of-google/ ("In 2021, Google's ad revenue amounted to 209.49 billion U.S. dollars…Advertising accounts for the majority of Google's revenue, which amounted to a total of 256.73 billion U.S. dollars in 2021."). *See also* GOOG-PLAY-004113976.R at -979.R ([redacted]).

944. Rosenberg Dep. at 410:8-413:14.

945. *See, e.g.*, Allison Kidd, *Technology experiences: what makes them compelling?*, HPLabs Technical Report (2001).

advertising revenue. Google would still have an incentive to provide consumers access to free Apps (to try the Apps) because that is what sells the Apps and leads to purchases of paid In-App Content. In this respect, developers' and Google's incentives are aligned, competitive take rate or not. There is no reason to believe the business model of free initial App downloads would be eliminated because both Google and developers still want consumers to try and get hooked on Apps.

404. When Google cut its take rate from 30 percent to 15 percent for subscriptions longer than a year in 2018, or for all subscription revenue in 2022, it did not seek to offset the lost revenue by charging for Apps that were once free. Similarly, Google did not announce any increase in the take rate in the Android App Distribution Market in conjunction with its plans to offer a 15 percent take rate on the first $1 million in revenue for all developers in 2021. This evidence suggests that, in the competitive but-for world where Google would have to lower its take rate due to competition, it would still not seek to offset the lost revenue by charging consumers for downloading previously free Apps.

J. Focal-Point Pricing Does Not Undermine Classwide Impact

405. The use of focal-point pricing, using "customary prices" such as those ending in "99," would not undermine classwide impact.[946] First, developers are willing to prominently display non-focal-point prices to consumers.[947] Further, developers are willing to charge prices that violate the "99 rule" when passing on marginal cost savings from lower take rates to their customers. To illustrate, suppose that a developer has consistently charged [redacted] for In-App Content in the actual world due, in part, to focal-point pricing. Google would have kept [redacted] per transaction (equal to [redacted]), remitting the remainder to the developer. Steering is prohibited for this developer in the actual world. The gross margin on each in-App transaction (before considering other marginal costs) is [redacted] (equal to [redacted]). In a but-for world, a new payment processor (such as Paddle) emerges due to the elimination of the Aftermarket Restrictions and charges a ten percent take rate, which for this developer, would be [redacted] at the original price of [redacted]. With steering permitted, the developer can realize cost savings of [redacted] per transaction (equal to approximately [redacted]), but only if the developer can induce its customers to use the new payment processor rather than Google Play Billing. At this point, it is now profit-maximizing for the developer to deviate from focal-point pricing and share a portion of the savings with its customer via a lower price for in-App purchases. For example, the developer could drop its price for In-App Content made via the new processor to (say) $1.79, effectively splitting the savings with the customer for making the right choice. The developer's fee to the third-party payment processor falls to $0.179 per transaction (equal to 10 percent of $1.79). The developer's new gross margin (before considering other marginal costs) on transactions processed via the third-party processor is [redacted], which exceeds the prior gross margin of [redacted]. It no longer pays to abide by focal-point pricing. A key reason we do not see as much deviation from focal-point pricing in the actual world is that developers are not afforded the

947. Of the 200 "Top paid apps" in the Play Store, 43 of them (or 21.5 percent) have initial download prices that do not end in "99." *See* backup materials to this report. *See also* Top Paid Apps, Google Play, https://play.google.com/store/apps/collection/cluster?clp=0g4jCiEKG3RvcHNlbGxpbmdfcGFpZF9BUFBMSUNBVElPThAHGAM%3D:S:ANO1ljLdnoU&gsr=CibSDiMKIQobdG9wc2VsbGluZ19wYWlkX0FQUExJQ0FUSU9OEAcYAw%3D%3D:S:ANO1ljIKVpg.

opportunity to steer due to the Aftermarket Restrictions. Moreover, in the few episodes where we do observe steering in the actual world, developers have been observed to deviate from 99-cent pricing increments, as shown in Table 9 of the Singer Class Cert Report.

406. Moreover, Google *required* developers, until very recently, to charge at least 99 cents. Thus, for a large number of developers, the observed prices in the actual world could be the result of a restraint that Google imposed on their pricing. Record evidence indicates that developers requested (and ultimately received) increased pricing flexibility, eventually persuading Google to abandon its $0.99 pricing floor, so that they could deviate from $.99.[948] That Google imposed a 99-cent restriction on developers implies that Google believed developers would deviate from such pricing.

407. To the extent developers would prefer to maintain "supermarket-style" pricing in the but-for world, they could do so simply by ending their prices in "9," instead of "99" (e.g., $2.49), or in or in "5" (e.g. $4.95) as many do today.[949] (Thus, the solution above to my hypothetical example of steering was $1.79, twenty cents below $1.99, but still ending in a nine.) Sellers' strategy of ending prices in "9" or "5", such as $2.99 or $2.95" is commonly known as "odd pricing," "psychological pricing," or "charm pricing." The strategic reasoning that underlies this practice rests on the belief that consumers will focus on the numbers to the left of the decimal, thus demonstrating higher demand for a good priced at $2.99 than $3.00, despite the negligible price difference of one cent. The economic literature has classified odd prices to include those within 5 cents of the nearest highest dollar (.95 to .99) or one cent below the next highest ten cents (.19, .29, etc.).[950] Market practitioners sometimes apply the same heuristic, underscoring the fact that odd pricing does not limit itself only to prices ending in "99."[951] Nothing would prevent developers from setting prices at $1.79 versus $1.99, for example, as a result of a decrease in the

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948. *See* GOOG-PLAY-000355570.R at GOOG-PLAY-000355597.R [redacted]). The Play Store ultimately removed its $0.99 minimum pricing rule in our around early 2022. Archived web pages show that the Play Store had a U.S. minimum price of $0.99 as of late 2021. Play Console Help, Supported Locations for Distribution to Google Play Users, accessed Dec. 27, 2021, https://web.archive.org/web/20211227224037/https:/support.google.com/googleplay/android-developer/answer/10532353?visit_id=637762416354084080-1400722469&rd=1. As of mid-February 2022, the minimum price is listed at $0.05. Play Console Help, Supported Locations for Distribution to Google Play Users, accessed Feb. 18, 2022, https://web.archive.org/web/20220218131358/https:/support.google.com/googleplay/android-developer/answer/10532353?visit_id=637807868385671271-2942202130&rd=1.

949. *See, e.g.*, Google Play, Top Paid, https://play.google.com/store/apps (press "Top Paid" button) (showing various "Top paid Apps" with prices that do not end in "99." For example, as of April 21, 2022, the third most-popular paid App was "Torque Pro (OBD 2 & Car)," priced at $4.95 per download on the Play Store. Another paid App in the Top 20 was "Tasker," priced at $3.49 per download on the Play Store).

950. Judith Holdershaw, Philip Gendall and Ron Garland, *The Widespread Use of Odd Pricing in the Retail Sector*, MARKETING BULLETIN, 8, 1997, 53-58, Research Note 1, marketing-bulletin massey.ac nz/V8/MB_V8_N1_Holdershaw.pdf

951. *See* PriceIntelligently, Odd-Even Pricing, priceintelligently.com/odd-even-pricing# ("Odd pricing refers to a price ending in 1,3,5,7,9 just under a round number, such as $0.19, $2.47, or $64.93"). *See also*, Shopify, Odd-Even Pricing, shopify.com/encyclopedia/odd-even-pricing ("Odd-even pricing is a pricing strategy involving the last digit of a product or service price. Prices ending in an odd number, such as $1.99 or $78.25, use an odd pricing strategy, whereas prices ending in an even number, such as $200.00 or 18.50, use an even strategy").

take rate. As illustrated in Figure 21 below, "supermarket pricing" is already observed in the Play Store, with prices at regular, ten-cent intervals.

FIGURE 21: PLAY STORE TRANSACTION PRICES AT TEN-CENT INTERVALS ($0.09 - $4.49)

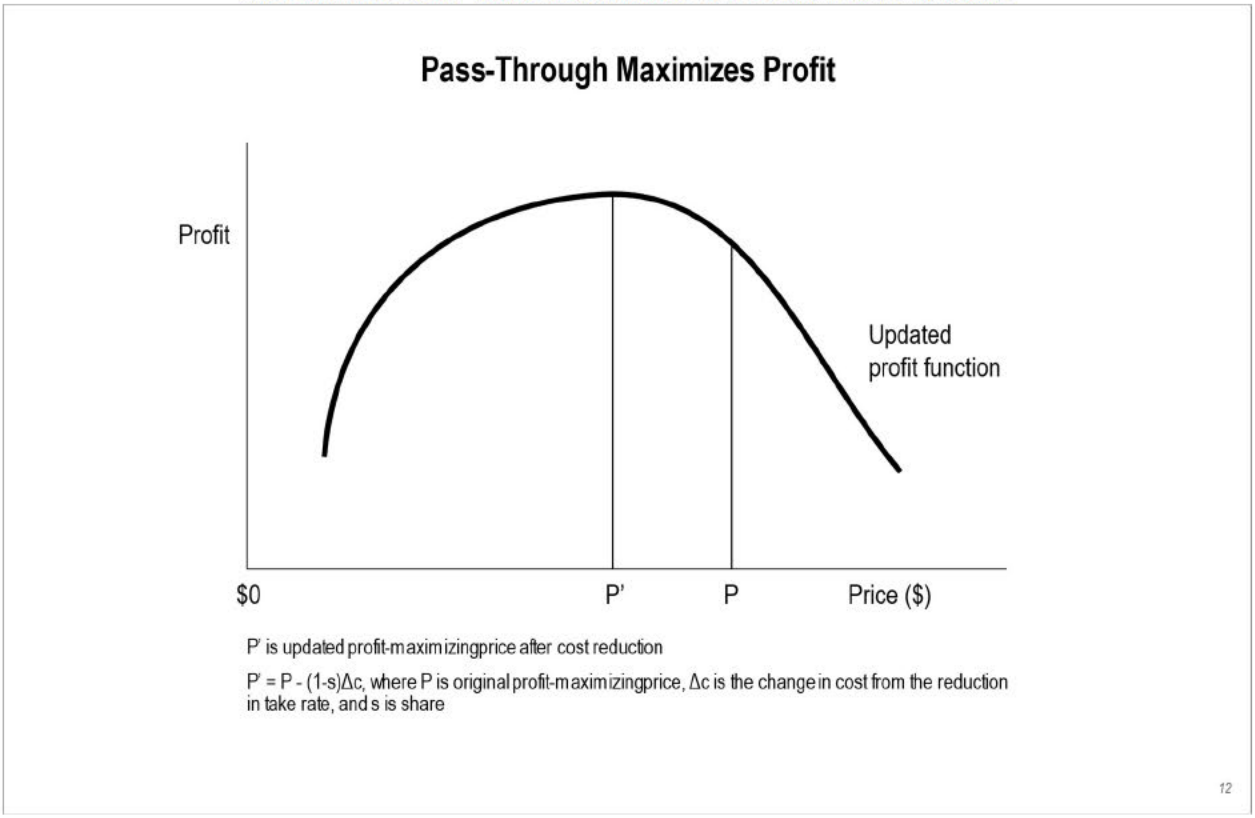
Source: Google Transaction Data. Note: Prices are also observed at one-cent intervals (not shown here).

This pattern of [redacted] pricing increments remains consistent until [redacted].[952]

408. Furthermore, if focal-point pricing were widely used, my models can accommodate it. To illustrate, consider the example below. The firm begins with a profit-maximizing price (P) at the original costs. Suppose next that there is a change in the costs, such as a permanent reduction in take rates. The firm re-optimizes by choosing a new price (P') which maximizes the new profit function. The logit model tell us precisely by how much the firm alters its price: Start with the old price and then subtract the product of one minus the firm's share and the change in cost.

952. Google Transaction Data (GOOG-PLAY-007203251).

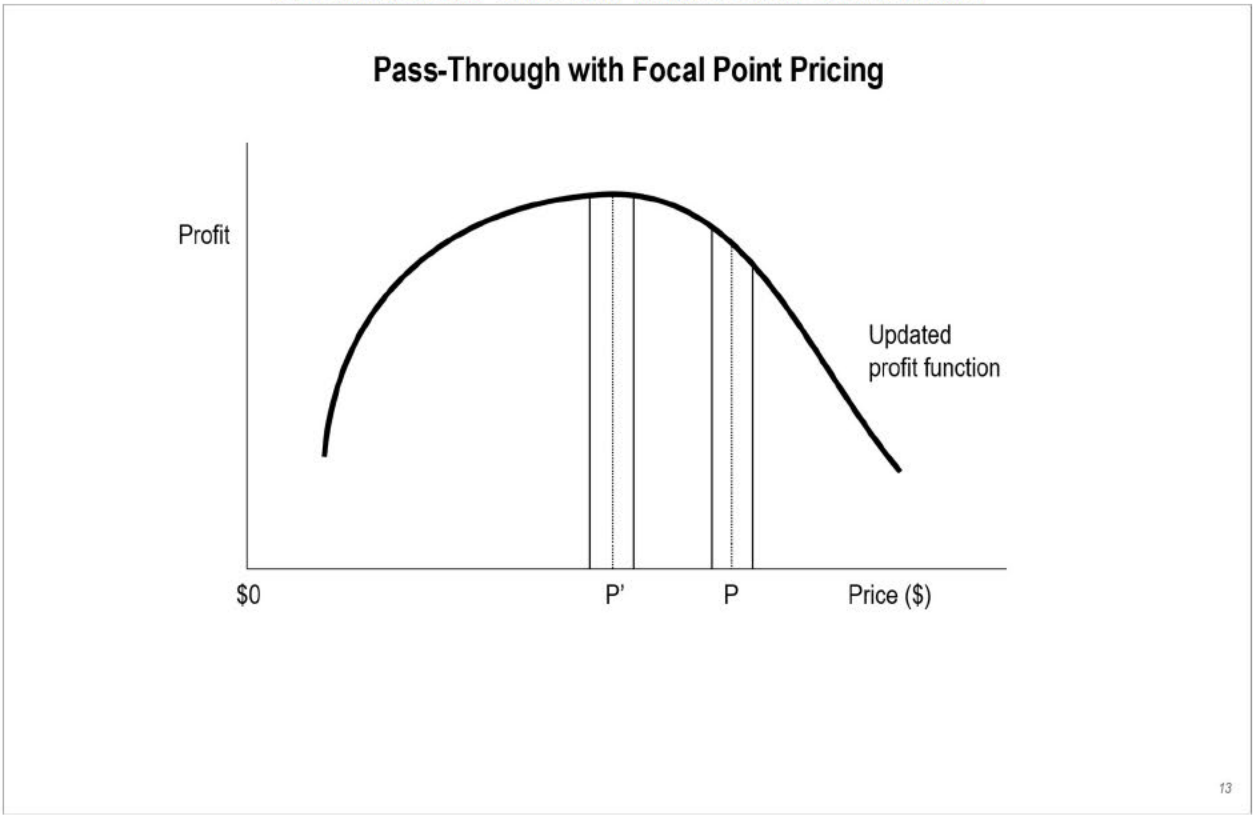
FIGURE 22: PASS-THROUGH WITHOUT FOCAL POINT PRICING



409. To take a simple numerical example, assume the price was initially $10, and that the take rate falls by 15 percentage points, yielding cost savings of $1.50. Suppose that the firm's share within the category is ten percent. This yields a but-for price of P' = $10 – (1-.1) x $1.50 = $8.65. This yields a savings for consumers of $10 - $8.65 = $1.35.

410. Now consider a firm that places some consideration on ending its price with a nine, perhaps based on a belief that consumers discount the last digits and "focus" on the first digits.

FIGURE 23: PASS-THROUGH WITH FOCAL POINT PRICING



411. As seen above, the firm is willing to deviate from the profit-maximizing price as predicted by economic theory to accommodate a taste for a price ending in a nine. It will deviate by the smallest step possible in either direction.

412. Consider another numerical example, this time beginning with an in-App price of $9.99. The change in marginal cost owing to a 15-percentage point decrease in the take rate is [$9.99 x 0.15] = $1.4985. The logit model predicts that the unconstrained new profit-maximizing pricing is P' = $9.99 – (1-.1) x $1.4985 = $8.64. To accommodate the developer's taste for ending in a nine, however, the developer chooses either $8.59 or $8.69. But the consumer is still better off by between $1.30 and $1.40.

413. In Table 17 below, I have implemented a comparable analysis for all Apps in Google's Transaction Data. As seen below, only [redacted] of transactions (representing just [redacted] of consumer expenditure) in the Play Store would not have seen a price decrease in the but-for world when the but-for price is constrained to end in "9."

TABLE 17:
AT MOST A *DE MINIMIS* SHARE OF APPS WOULD NOT LOWER PRICE DUE TO FOCAL-POINT PRICING

	(1)	(2)
	% of all Units Sold	% of all Consumer Expenditures
App Distribution Market	[redacted]	
In-App Aftermarket		
Combined Markets		

Source: Google Transaction Data. *Notes*: Focal-Point Pricing defined as price ending in "9", consistent with the economic literature. This analysis was performed using before-tax prices. Each app-month's but-for price was rounded to the nearest price with a hundredth decimal place ending in "9." This but-for focal-point price was then compared to the actual price charged. Column (1) displays the percentage of all units sold which would not have had a decreased App price in the but-for world. Column (2) displays this amount in terms of the sales revenues generated.

VII. AGGREGATE DAMAGES TO THE U.S. CONSUMERS

A. App/In-App Models

414. U.S. Consumers' aggregate damages are computed using the overcharges calculated in Tables 6 and 8. These damages are summarized in Table 18. In Appendix 5, I break down these damages by U.S. state and territory.

TABLE 18: AGGREGATE DAMAGES, APP/IN-APP MODELS (U.S., 8/16/2016 – 5/31/2022)

		Android App Distribution Market (Table 6)	In-App Aftermarket (Table 8)	Aggregate
[1]	**Average Actual Consumer Price**	[redacted]		
[2]	**Average But-For Consumer Price**			
[3] = [1]-[2]	**Average Overcharge**			
[4]	**Quantity Purchased**			
[5]	**Aggregate Damages**			

Notes: Aggregate prices and overcharges are weighted averages across both markets.

415. In the event that proof of pass-through is not legally necessary, I have been asked to calculate aggregate damages based on the full reduction in the take rate in the but-for world. Under this assumption, aggregate damages for the Android App Distribution Market come to [redacted] and aggregate damages in the In-App Aftermarket come to [redacted]

B. Discount Model and Single Take Rate

416. Table 19 summarizes aggregate damages in the combined Android App Distribution Market and In-App Aftermarket under the modeling scenario where the locus of competition is on the consumer subsidy (as presented in Section VI.E and Table 16), and under the combined markets take rate competition model, where competition occurs only with respect to the take rate in a single, combined market (as presented in Appendix 4 and Table A4).

TABLE 19: AGGREGATE DAMAGES SUMMARY: DISCOUNT MODEL AND SINGLE TAKE RATE, (U.S., 8/16/2016 – 5/31/2022)

		Discount Model (Table 16)	Single Take Rate Model (Table A4)
[1]	Average Actual Consumer Price	[redacted]	
[2]	Average But-For Consumer Price		
[3] = [1]-[2]	Average Overcharge		
[4]	Quantity Purchased		
[5]	Aggregate Damages		

In the event that proof of pass-through is not legally necessary, I have been asked to calculate aggregate damages based on the full reduction in the take rate in the but-for world. Under this assumption, aggregate damages for the Single Take Rate model come to $4.01 billion. Aggregate damages for the discount model, which does not depend on pass-through, would be the same.

C. Amazon Discount Damages

417. The Amazon Appstore has consistently offered substantial discounts to customers that access the Amazon Appstore via Google Android devices.[953] As seen below, financial data produced by Amazon show that gross consumer expenditures in the Amazon Appstore on Google Android devices came to [redacted] from 2018-2021. Amazon kept [redacted] of these revenues and developers kept [redacted] The remaining [redacted] came in the form of discounts such as Amazon Coins.[954]

953. *See* Part VI.B.5.c above.

954. According to Amazon's financials, [redacted] *See* AMZ-GP_00002471 [redacted] In addition, the data indicate that [redacted]

TABLE 20: AMAZON APPSTORE FINANCIAL DATA, THIRD PARTY DEVICES (2018-2021)

[1]	Gross Order Product Sales (OPS)	[redacted]
[2]	Net OPS (net of discounts)	
[3]	*Developer Revenue*	
[4]	*Amazon Revenue*	
[4]/[1]	Amazon Take Rate	
[3]/[1]	Developer Share	
[2]/[1]	Amazon Discount	

Source: AMZ-GP_00002471 (Morrill Exhibit 1363) ('Summary_4' tab).

418. I understand that the legal standard for calculating damages allows for reasonable approximation. The Amazon Appstore's consumer discounts provide a reasonable benchmark for calculating aggregate damages. The Amazon Appstore, like the Play Store, participates in Android App Distribution Market. Like the Play Store, the Amazon Appstore is available on third-party smartphones and tablets that Amazon does not own. But unlike the Play Store, the Amazon Appstore is not dominant in the Android App Distribution Market, and is obliged to compete on the merits. Amazon has chosen to compete by offering generous consumer subsidies. Moreover, according to Amazon's own documents, [redacted].[955] Moreover, in the absence of the Challenged Conduct, both Amazon and the Play Store would likely face additional competition from additional entrants, which could result in greater consumer discounts than those observed here.

419. Amazon's consumer discounts increase with user purchase volumes. For example, users can purchase Amazon Coins worth $100 for $82, for a discount of 18 percent, or Amazon Coins worth $500 for $400, for a discount of 20 percent; users can also purchase Amazon Coins worth $3 for $2.91, for a discount of three percent. Users can also earn Amazon Coins by purchasing eligible Apps and In-App Content through the Amazon Appstore. Amazon Coins do not expire, so even users who purchase small volumes on a monthly basis can receive discounts associated with high purchase volumes.[956] For purposes of calculating aggregate damages, the relevant statistic is the share of consumer expenditure that the Amazon Appstore pays out in consumer discounts in the aggregate on third-party devices (as opposed to the average per-customer discount). Accordingly, Amazon's aggregate discount of [redacted] on third-party devices is a reasonable benchmark for estimating aggregate damages.

420. Aggregate damages using the Amazon Appstore benchmark are calculated by multiplying aggregate consumer expenditure in the Play Store by the difference between (1) the Amazon Appstore's [redacted] consumer subsidy, and (2) the modest [redacted] subsidy that the Play Store paid to consumers in the actual world. This calculation yields aggregate damages of [redacted]. Table 21 also displays the damages resulting from my Discount Model; these damages are significantly lower [redacted]) because the Discount Model conservatively assumes that the Play Store would enjoy a durable incumbency advantage in a more competitive

955. AMZ-GP_00002484, at 2488.
956. *See, e.g.,* https://www.amazon.com/coins.

but-for world—even when facing a rival such as Amazon or Facebook. Thus, Table 21 provides a range of aggregate damages flowing from foregone direct consumer discounts.

TABLE 21: DISCOUNT DAMAGES RANGE, U.S., 8/16/2016 – 5/31/2022

[1]	Actual Consumer Expenditure (Before Discounts)	[redacted]
[2]	Amazon Benchmark Consumer Subsidy	
[3]	Play Store Consumer Subsidy	
[4]=([2] - [3])*[1]	**Amazon Discount Damages**	
[5]	**Discount Damages (Table 16)**	

D. Aggregate Damages Extrapolated Through Mid-2023

421. Below I calculate aggregate damages through the expected trial date, extrapolating damages between May 31, 2022 and June 5, 2023. To perform the extrapolations, I first calculated the average daily damages during the time period from 8/16/2016 – 5/31/2022, and then assumed the same daily average for the time period from 6/1/2022 – 6/5/2023.

TABLE 22: EXTRAPOLATED AGGREGATE DAMAGES (U.S.)

Damages Model	Time Period		Total
	8/16/2016 – 5/31/2022	6/1/2022 – 6/5/2023	
Android App Distribution Market	[redacted]		
In-App Aftermarket			
Discount Model			
Single Take Rate			
Hybrid Model			
Amazon Discount Model			

VIII. INDIVIDUAL U.S. CONSUMER-SPECIFIC DAMAGES

422. Below I present a formula for computing a given individual U.S. Consumer's damages based on the individual's purchase history.[957]

423. An individual consumer's damages are equal to the quantity purchased of each product multiplied by the difference between the actual and but-for price paid for her purchases in

957. For ease of exposition and presentation, here I present U.S. Consumer-Specific damages based on a U.S. Consumer's purchases within each of Google's 33 categories. However, the same framework could also be applied at the level of the developer. U.S. Consumer-specific damages would then be calculated based on an individual's expenditures at different developers, instead of different categories.

the Android App Distribution Market and the In-App Aftermarket. Mathematically, individual damages can be expressed as:

$$\text{Damages} = \sum_i OC\_AD_i \times Q\_AD_i + \sum_j OC\_AM_j \times Q\_AM_j$$

where OC_AD_i represents the overcharge in the Android App Distribution Market (for paid Apps)—that is, difference between the actual price and the but-for price. The term Q_AD_i represents the actual quantity purchased by a U.S. Consumer in the Android App Distribution Market. Similarly, OC_AM_j represents the overcharge in the In-App Aftermarket (for In-App Content), and Q_AM_j represents the actual quantity purchased by a U.S. Consumer in the In-App Aftermarket.[958]

424. The actual purchase quantities for each individual U.S. Consumer (Q_AD_i and Q_AM_j) are reported in Google's transactional data. The overcharges are calculated from the economic models reviewed above. Specifically, OC_AD_i is calculated using the two-sided market model presented in Section V.B, and OC_AM_j is calculated using the one-sided market model presented in Section V.C.

425. The overcharges depend on (1) how much the take rate falls in the competitive but-for world; and (2) the extent to which the lower take rate is passed on in the form of lower prices. With respect to (2), I have calculated pass-through rates for different developer categories in Section V.D above. A U.S. Consumer's damages will therefore depend on the category of Apps that the consumer purchased. All else equal, the higher the pass-through rate of the category purchased by a particular U.S. Consumer, the higher that U.S. Consumer's damages will be.

426. With respect to (1), the drop in the take rate will often be similar or identical across categories: Most categories have similar (or identical) take rates in the actual world, and would also have similar (or identical) take rates in the but-for world. Nevertheless, I allow for variation in the but-for take rate across categories as follows: Suppose that the overall take rate is 30 percent in the actual world, and that a given category has an actual take rate of 29 percent. Suppose further that the overall but-for take rate is 20 percent. The category's but-for take rate would be calculated as [20 percent] x [29 percent]/[30 percent] = 19.33 percent. More generally, a category's but-for take rate is permitted to deviate from the overall but-for take rate in the same proportion in which the category's actual take rate deviates from the average actual take rate.

427. To illustrate, suppose that a consumer spent $10 on Apps in the "Art and Design" category in the Android App Distribution Market, as illustrated in the first row of Table 23 below. The actual take rate for the "Art and Design" category is 26.4 percent, and the but-for take rate for that same category is 20.2 percent. The pass-through rate for "Art and Design" is 67 percent. Given these inputs, the U.S. Consumer's expenditures would fall to $9.52 in the but-for world. To see this, let P_b represent the consumer's but-for expenditures. Let t_a and t_b represent the actual and but-

958. The summation operator ($\sum$) is used because a U.S. Consumer may have multiple transactions in the Android App Distribution Market and the In-App Aftermarket.

for take rates, and let γ be the pass-through rate. The difference between the U.S. Consumer's actual and but-for expenditures is [$10 – P_b]. This difference satisfies the following equation:

$$[\$10 - P_b] = \gamma[\$10t_a - P_b t_b]$$

428. Solving for P_b, we obtain $P_b = \$10x([1- \gamma t_a]/[1 - \gamma t_b])$. Inserting the inputs from the "Art and Design" category, we have $P_b = \$10x([1- 0.67*0.264]/[1 - 0.67*0.202]) = \$9.52$.[959] Thus, a U.S. Consumer with $10 of expenditures in the "Art and Design" category of the Android App Distribution Market would have damages of $10 - $9.52 = $0.48. In other words, damages would equal 4.8 percent of expenditures (equal to $0.48/$10). Comparable calculations are performed for each remaining category in subsequent rows of Table 23.

959. More precisely, the actual take rate for the "Art and Design" category is 0.2645 with a pass-through equal to 0.69.

TABLE 23: ILLUSTRATIVE U.S. CONSUMER DAMAGES: ANDROID APP DISTRIBUTION MARKET

Category	CM Expenditure	Actual Take Rate	But-For Take Rate	Pass-Through Rate	But-For Expenditure	CM Damages	CM Overcharge (%)
ART_AND_DESIGN	$10.00	[redacted]	[redacted]	67%	[redacted]	[redacted]	[redacted]
AUTO_AND_VEHICLES	$10.00			82%			
BEAUTY	$10.00			44%			
BOOKS_AND_REFERENCE	$10.00			85%			
BUSINESS	$10.00			85%			
COMICS	$10.00			60%			
COMMUNICATION	$10.00			88%			
DATING	$10.00			81%			
EDUCATION	$10.00			92%			
ENTERTAINMENT	$10.00			85%			
EVENTS	$10.00			47%			
FINANCE	$10.00			74%			
FOOD_AND_DRINK	$10.00			81%			
GAME	$10.00			94%			
HEALTH_AND_FITNESS	$10.00			94%			
HOUSE_AND_HOME	$10.00			70%			
LIBRARIES_AND_DEMO	$10.00			59%			
LIFESTYLE	$10.00			66%			
MAPS_AND_NAVIGATION	$10.00			84%			
MEDICAL	$10.00			93%			
MUSIC_AND_AUDIO	$10.00			41%			
NEWS_AND_MAGAZINES	$10.00			88%			
PARENTING	$10.00			85%			
PERSONALIZATION	$10.00			87%			
PHOTOGRAPHY	$10.00			92%			
PRODUCTIVITY	$10.00			84%			
SHOPPING	$10.00			41%			
SOCIAL	$10.00			89%			
SPORTS	$10.00			80%			
TOOLS	$10.00			96%			
TRAVEL_AND_LOCAL	$10.00			88%			
VIDEO_PLAYERS	$10.00			86%			
WEATHER	$10.00			80%			

429. Table 24 below performs comparable calculations for the In-App Aftermarket. For example, suppose that a U.S. Consumer spent $10 on in-App purchases in the "Game" category. This category has an actual take rate of [redacted], a but-for take rate of [redacted] and a pass-through rate of 94 percent. Applying the prior formula, the U.S. Consumer's but-for expenditures

are [redacted].[960] This yields damages of [redacted] for each $10 of U.S. Consumer expenditures in the "Game" category of the In-App Aftermarket. In other words, damages would be [redacted] of expenditures [redacted]

TABLE 24: ILLUSTRATIVE U.S. CONSUMER DAMAGES: IN- APP AFTERMARKET

Category	CM Expenditure	Actual Take Rate	But-For Take Rate	Pass-Through Rate	But-For Expenditure	CM Damages	CM Overcharge (%)
ART_AND_DESIGN	$10.00			67%			
AUTO_AND_VEHICLES	$10.00			82%			
BEAUTY	$10.00			44%			
BOOKS_AND_REFERENCE	$10.00			85%			
BUSINESS	$10.00			85%			
COMICS	$10.00			60%			
COMMUNICATION	$10.00			88%			
DATING	$10.00			81%			
EDUCATION	$10.00			92%			
ENTERTAINMENT	$10.00			85%			
EVENTS	$10.00			47%			
FINANCE	$10.00			74%			
FOOD_AND_DRINK	$10.00			81%			
GAME	$10.00			94%			
HEALTH_AND_FITNESS	$10.00			94%			
HOUSE_AND_HOME	$10.00			70%			
LIBRARIES_AND_DEMO	$10.00			59%			
LIFESTYLE	$10.00			66%			
MAPS_AND_NAVIGATION	$10.00			84%			
MEDICAL	$10.00			93%			
MUSIC_AND_AUDIO	$10.00			41%			
NEWS_AND_MAGAZINES	$10.00			88%			
PARENTING	$10.00			85%			
PERSONALIZATION	$10.00			87%			
PHOTOGRAPHY	$10.00			92%			
PRODUCTIVITY	$10.00			84%			
SHOPPING	$10.00			41%			
SOCIAL	$10.00			89%			
SPORTS	$10.00			80%			
TOOLS	$10.00			96%			
TRAVEL_AND_LOCAL	$10.00			88%			
VIDEO_PLAYERS	$10.00			86%			
WEATHER	$10.00			80%			

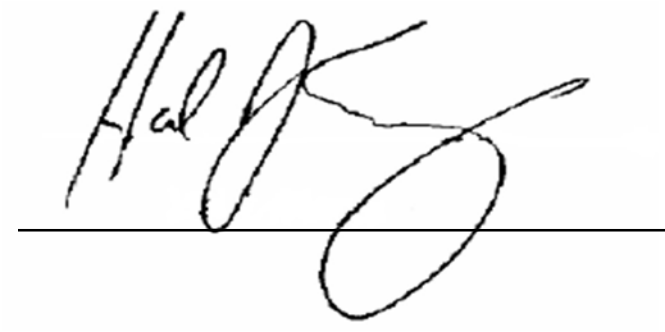
960. More precisely, pass-through for the "Game" category is 0.9378.

CONCLUSION

430. For the foregoing reasons, I conclude that the Challenged was anticompetitive and resulted in injury to competition and consumers, including U.S. Consumers overpaying for initial downloads from the Play Store and for In-App Content. In addition, the proposed Injunctive Class would benefit from removal of the Challenged Conduct.

* * *

Hal J. Singer, Ph.D.:



Executed on October 3, 2022.

APPENDIX 1: CURRICULUM VITAE OF HAL J. SINGER

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ECON ONE, Washington, D.C.: Managing Director 2018-present.

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GEORGETOWN UNIVERSITY, MCDONOUGH SCHOOL OF BUSINESS, Washington, D.C.: Adjunct Professor 2010, 2014, 2016, 2018, 2019, 2020, 2021, 2022

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Honors

Honoree, Outstanding Antitrust Litigation Achievement in Economics, American Antitrust Institute, *In re Lidoderm Antitrust Litigation,* Oct. 9, 2018.

Finalist, Outstanding Antitrust Litigation Achievement in Economics, American Antitrust Institute, *Tennis Channel v. Comcast*, Dec. 4, 2013.

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Deposition of Andy Rubin (May 17, 2022; May 18, 2022)

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Deposition of Hiroshi Lockheimer (Aug. 15, 2022; Aug. 16, 2022)

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Deposition of Sandra Alzetta (September 29, 2022)

Deposition of Sarah Karam (Sept. 28, 2022 – rough transcript)

APPENDIX 3: EXTENSIONS OF TWO-SIDED MARKET MODEL

431. In what follows, I derive the expressions used in Parts VI.B, VI.E, and Appendix 4 for demonstrating impact in the particular two-sided setting relevant to the instant case. This "applied" modeling is an extension of the "foundational" model in Rochet and Tirole (2003). I discuss three cases: (1) a case where competition occurs only with respect to the take rate t, (2) a case where competition occurs only with respect to the buyer-side price P_B, and (3) a case where competition occurs with respect to both the take rate t and the buyer-side price P_B.

432. In Rochet and Tirole 2003, the monopolist platform operator maximizes profit (denoted π^0) defined as:

(A.1) $$\pi^0 = (P_B + P_S - C)D_B(P_B)D_S(P_S)$$

where P_B and P_S are buyer- and seller-side platform prices, respectively; C is marginal transaction cost, and $D_B(P_B)$ and $D_S(P_S)$ are demand functions for buyers and sellers, respectively.[961] I extend the model (1) to accommodate Google charging a percentage take rate on the developer (seller) side, (2) to allow the average App or In-App Content (product) price (set by developers) to be a function of the take rate, and (3) to allow consumer (buyer) demand to be a function of the net App or In-App Content (product) price, defined as the sum of the product price and the platform price. The new profit function (denoted π) can be written as:

(A.2) $$\pi = (P_B + tS(t) - C)D_B(S(t) + P_B)D_S(t)$$

where $S(t)$ is the price of paid App downloads and t is the take rate or portion of consumer spend that is retained by Google.

433. Before continuing the exposition, it is useful to define the pass-through parameter γ which I refer to throughout:

(A.3) $$\gamma = \frac{\Delta SQ}{\Delta vQ} = \frac{\Delta S}{\Delta v}$$

where ΔS is the dollar change in product price to consumers and Δv is the dollar change in costs (including commissions paid to Google) to developers.

961. Rochet & Tirole at 996.

A. Case 1: Platform Operator Maximizes Profit Only With Respect to the Take Rate (Buyer-Side Platform Price Is Held Fixed)

434. In this subsection, I present the derivations used to arrive at Equations (V.3) and (V.5) in the report. If the platform operator maximizes profit with respect to the take rate, holding the buyer-side platform price fixed, the following first-order condition[962] follows from (A.2):

(A.4) $$\frac{S + tS'}{P_B + tS - C} - \frac{\varepsilon_{B,t}}{t} - \frac{\varepsilon_{S,t}}{t} = 0$$

where S' is the change in the product price with respect to the take rate, and the "take-rate elasticities" are:

(A.5) $$\varepsilon_{B,t} = -\frac{tS'D_B'}{D_B}$$

(A.6) $$\varepsilon_{S,t} = -\frac{tD_S'}{D_S}$$

D_B' and D_S' are first derivatives of the buyer and seller demand functions. Re-arranging (A.4):

$$\frac{S + tS'}{P_B + tS - C} = \frac{\varepsilon_{B,t} + \varepsilon_{S,t}}{t}$$

Inverting each side:

$$\frac{P_B + tS - C}{S + tS'} = \frac{t}{\varepsilon_{B,t} + \varepsilon_{S,t}}$$

Dividing by t gives Equation (V.3):

(A.7), (V.3) $$\frac{P_B + tS - C}{tS + t^2S'} = \frac{1}{\varepsilon_{B,t} + \varepsilon_{S,t}}$$

Let k be a developer's marginal cost. The per-unit cost to developers from the take rate is equal to $tS(t)$, implying that the change in marginal cost resulting from a change in the take rate is $\frac{\partial k}{\partial t} = S(t) + tS'(t)$. Setting $\Delta v = S(t) + tS'(t)$ and $\Delta S = S'(t)$ (the changes in price and cost, respectively, resulting from a change in the take rate) in expression (A.3) gives $\gamma = \frac{S'(t)}{S(t)+tS'(t)}$. Re-arranging gives the following expression for $S'(t)$:

962. A first-order condition describes the point at which profit maximization is achieved and is a commonly used tool in economic modeling. *See, e.g.,* JEFFREY M. PERLOFF, MICROECONOMICS A-34 (Pearson 7th ed. 2015). As in Rochet and Tirole, I apply the log-transform to the profit function, then take the derivative with respect to t.

(A.8) $$S'(t) = \frac{\gamma}{1 - t\gamma} S(t)$$

435. In a monopoly setting, elasticities reflect that the platform operator faces no competition. In a competitive setting, profit is maximized with respect to "residual" demand, defined as the demand curve faced by the platform operator in the presence of competition.[963] To determine the competitive equilibrium condition, I replace demand functions $D_B(S(t) + P_B)$ and $D_S(t)$ in expression (A.2) with residual demand functions and repeat steps (A.4) through (A.7). Residual demand functions are formally defined as the difference between market demand and the quantity being supplied by the firm's rivals:

(A.9) $$RD_B(S(t) + P_B) = D_B(S(t) + P_B) - Q_{R,B}(S(t) + P_B)$$

(A.10) $$RD_S(t) = D_S(t) - Q_{R,S}(t)$$

where $Q_{R,B}(S(t) + P_B)$ and $Q_{R,S}(t)$ represent the amount of product supplied by the platform's rivals at price $S(t) + P_B$ and take rate t.[964] Steps (A.4) through (A.7) using the residual demand curves then give the analogous competitive expression used in Equation (V.5):

(A.11), (V.5) $$\frac{P_B + tS - C}{tS + t^2 S'} = \frac{1}{\varepsilon_{OB,t} + \varepsilon_{OS,t}}$$

where $\varepsilon_{OB,t}$ and $\varepsilon_{OS,t}$ are "own-brand" elasticities on the buyer (consumer) and seller (developer) sides, respectively, reflecting the change in quantity demanded from consumers for transaction on the firm's (Google's) platform in response to a change in the take rate and in the presence of competition.

436. To solve for the product price in the competitive setting, I use the pass-through equation (A.3), and note that the change in the total commissions (from $t^M S^M$ to $t^C S^C$) from a change in the take rate satisfies:

(A.12) $$\gamma = \frac{\Delta S}{\Delta v} = \frac{S^M - S^C}{t^M S^M - t^C S^C}$$

963. *See, e.g.,* Landes & Posner at 985.
964. *Id.*

where superscripts ^{M} and ^{C} denote the monopoly and competitive cases, respectively. Re-arranging allows expression of the product price in the competitive world in terms of the competitive take rate and monopoly inputs:

(A.13), (V.8)
$$S^C = S^M \frac{1 - \gamma t^M}{1 - \gamma t^C}$$

Using this expression, I can then solve for the competitive take rate that satisfies (A.10), having estimated the other inputs (S^M, C, and competitive elasticities).

B. Case 2: Platform Operator Maximizes Profit Only With Respect to the Buyer-Side Platform Price (Take Rate Is Held Fixed)

437. Using the same objective function (A.2) but maximizing profit with respect to the buyer-side platform price yields the following first-order condition, now taken with respect to P_B:

(A.14)
$$\frac{1}{P_B + tS(t) - C} - \frac{\varepsilon_B}{(S + P_B)} = 0$$

where ε_B is the price elasticity of demand for App products (taken with respect to the net price $S + P_B$):

(A.15)
$$\varepsilon_B = -\frac{(S + P_B)D_B{}'}{D_B}$$

Re-arranging (A.13) gives Equation (V.11):

(A.16), (V.11)
$$\frac{P_B + tS - C}{S + P_B} = \frac{1}{\varepsilon_B}$$

438. To solve for the competitive equilibrium condition, I replace demand functions $D_B(S(t) + P_B)$ and $D_S(t)$ with residual demand functions (defined in Equations A.9 and A.10) in expression (A.2) and repeat steps (A.14) through (A.16). This gives the competitive expression used in Equation (V.12):

(A.17), (V.12)
$$\frac{P_B + tS - C}{S + P_B} = \frac{1}{\varepsilon_{OB}}$$

Note that the product price elasticity of demand is related to the *take rate* elasticity of demand (given by Equation (A.5)):

$$\varepsilon_B = -\frac{tS'D_B'}{D_B} * \frac{(S + P_B)}{S'}$$

or

(A.18)
$$\varepsilon_B = \varepsilon_{B,t} \frac{(S + P_B)}{tS'}$$

The analogous expression using own-brand elasticities is:

(A.19) $$\varepsilon_{OB} = \varepsilon_{OB,t}\frac{(S + P_B)}{tS'}$$

The developer-side take rate elasticity of demand is also related to the developer-side price elasticity of demand, where the developer-side price is equal to the take rate multiplied by the product price. Define the developer price as $H = tS(t)$ and developer side demand as a function of price as $Q(H)$. Define developer-side price elasticity of demand as:

(A.20) $$\varepsilon_S = -\frac{HQ'(H)}{Q(H)} = -\frac{tS(t)Q'\big(tS(t)\big)}{Q\big(tS(t)\big)}$$

Noting that $Q\big(tS(t)\big) = D(t)$, Equation (A.6) implies that

(A.21) $$\varepsilon_{S,t} = -\frac{tQ'\big(tS(t)\big)\big(S(t) + tS'(t)\big)}{Q\big(tS(t)\big)}$$

Using Equation (A.8) then implies:

$$\varepsilon_{S,t} = -\frac{tS(t)Q'\big(tS(t)\big)\left(1 + \frac{t\gamma}{1 - t\gamma}\right)}{Q\big(tS(t)\big)}$$

which simplifies to:

(A.22) $$\varepsilon_{S,t} = \varepsilon_S\left(\frac{1}{1 - t\gamma}\right)$$

The analogous expression using own-brand elasticities is:

(A.23) $$\varepsilon_{OS,t} = \varepsilon_{OS}\left(\frac{1}{1 - t\gamma}\right)$$

C. Case 3: Platform Operator Maximizes Profit Simultaneously With Respect to Both the Buyer-Side Platform Price and the Take Rate

439. In this model, a monopolist platform operator maximizes its profits by setting the take rate t and the buyer-side platform price P_B such that both first order conditions (A.4) and (A.14) are satisfied, or equivalently, the following two conditions are satisfied:

(A.7), (V.3) $$\frac{P_B + tS - C}{tS + t^2S'} = \frac{1}{\varepsilon_{B,t} + \varepsilon_{S,t}}$$

(A.16), (V.11)
$$\frac{P_B + tS - C}{S + P_B} = \frac{1}{\varepsilon_B}$$

where S is the product price, C is marginal platform transaction cost, γ is the pass-through rate, $\varepsilon_{B,t} + \varepsilon_{S,t}$ is the sum of buyer and seller-side take rate elasticities of demand, and ε_B is the buyer-side product price elasticity of demand. In the competitive setting, the analogous two conditions are satisfied:

(A.11), (V.5)
$$\frac{P_B + tS - C}{tS + t^2 S'} = \frac{1}{\varepsilon_{OB,t} + \varepsilon_{OS,t}}$$

(A.17), (V.12)
$$\frac{P_B + tS - C}{S + P_B} = \frac{1}{\varepsilon_{OB}}$$

where $\varepsilon_{OB,t} + \varepsilon_{OS,t}$ is the sum of own-brand buyer and own-brand seller-side take rate elasticities of demand, and ε_{OB} is own-brand buyer-side product price elasticity of demand. Given the inputs $C, \gamma, \varepsilon_{OB}, \varepsilon_{OB,t}, \varepsilon_{OS,t}$, which I estimate, leaves two unknowns: t, P_B, which I can then determine using the two equations.

APPENDIX 4: RESULTS OF SINGLE MARKET TAKE RATE MODEL AND SINGLE-MARKET HYBRID MODEL

440. In Part VI.B above I present a model in which the locus of platform competition in the Android App Distribution Market was the take rate. That is, absent Google's anticompetitive restrictions, I model the extent to which Google would lower its take rate in response to competition. In this model, I hold the buyer-side subsidy fixed at its observed proportion to the paid App download price. In Part VI.E, I presented an alternative model in which Google increases its loyalty points program for consumers to encourage their use of the Play Store and Google Play Billing rather than using a competing source of Apps or In-App Content. In this buyer-side platform competition model, I model competition with respect to a single per-unit consumer subsidy across both initial paid App downloads and purchases of In-App Content, as Google's present (though small in magnitude) loyalty points program uses this structure (rather than having two different points programs). In this model, I hold the take rate fixed at its observed monopoly level.

441. Here I present two more scenarios (the "single market take rate model" and "single-market hybrid model"). In the single-market take rate model, competition occurs only with respect to a take rate (holding the buyer-side subsidy fixed). In the single-market hybrid model, competition occurs with respect to both the take rate and buyer-side subsidy. Both models apply to a single combined market which includes both the Android App Distribution Market and the In-App Aftermarket. The single market take rate model follows the same steps as the Android App Distribution Market take rate model presented in Part VI.B; however, in the single market take rate model presented here, the platform operator maximizes profit by choosing a take rate that applies to all transactions (both initial downloads and in-App purchases). Because of this distinction, input values differ across models. In the single market hybrid model, the platform operator maximizes profit by simultaneously choosing a take rate and buyer subsidy that applies to all transactions (both paid initial downloads and In-App purchases).

442. For these two scenarios, my sources and methods for obtaining the monopoly inputs shown in Equation (V.3) are:

- P_B^M is equal to the (negative) price charged by Google to consumers for transactions made on its platform in the monopoly scenario. I compute the average value of this price as the sum of all promotions paid by Google for transactions made in both the Android App Distribution Market and In-App Aftermarket, divided by the total quantity of paid Apps downloaded in the Android App Distribution Market and purchases of In-App Content in the In-App Aftermarket, as observed in Google's transaction records.

- t^M is equal to the observed take rate, computed as the sum of all revenue retained by Google in the Android App Distribution Market and In-App Aftermarket divided by the sum of total revenue spent by consumers in the Android App Distribution Market and In-App Aftermarket (prior to Google's promotional expenditures, which are captured by P_B^M).

- S^M is equal to the average price charged for paid Apps in the Android App Distribution Market and In-App Content in the In-App Aftermarket in the monopoly setting, calculated as the total amount of revenue spent by consumers (prior to receiving promotions from Google) in the Android App Distribution Market and In-App Aftermarket divided by the

total quantity of paid Apps downloaded in the Android App Distribution Market and purchases of In-App Content in the In-App Aftermarket, as observed in Google's transaction records.

- Marginal cost C represents the incremental cost incurred by Google in executing a transaction. I refer to Google's financial data to infer this value, which suggests that [redacted].[965]

- γ is equal to the change in the App price S charged to consumers with respect to a change in developers' costs (including the cost imposed on developers through Google's take rate), also known as the pass-through rate. This parameter is discussed in detail in Section V.D, where I estimate its value at 91.1 percent.

- S'^M represents the change in the product price resulting from a small change in the take rate. I solve for S'^M in terms of the take rate and pass-through rate: $S'^M = \frac{\gamma}{(1-t^M\gamma)}S^M$. Appendix 3 contains a derivation of this expression (Equation (A.8)).

- ε_B^M is the buyer-side product price elasticity of demand for transactions in the Android App Distribution Market and In-App Aftermarket. Given the other inputs to the monopoly model, the value of ε_B^M is implied by Equation (V.11).

- ε_S^M is the seller-side product price elasticity of demand for transactions in the Android App Distribution Market and In-App Aftermarket. Given the other inputs to the monopoly model, the value of ε_S^M is implied by Equation (A.22).

- $\varepsilon_{B,t}^M$ and $\varepsilon_{S,t}^M$ are the take-rate elasticities of demand for transactions in the Android App Distribution Market and In-App Aftermarket from consumers and developers, respectively, in the presence of Google's monopoly. Given the other inputs to the monopoly model, the value of the sum $\varepsilon_{B,t}^M + \varepsilon_{S,t}^M$ is implied by Equation (V.3).

443. I hold inputs C and γ fixed between the monopoly and competitive scenarios. My sources and methods for obtaining the remaining inputs to the competitive scenario expression shown in Equation (V.5) are:

- t^C is equal to the but-for (competitive) take rate. I solve for the but-for take rate by finding the value that satisfies Equation (V.5) given the remaining inputs.

- S^C is the price of paid App downloads and In-App Content that developers would charge in a competitive scenario. S^C can be calculated in terms of other inputs (S^M, t^M, t^C, γ) according to Equation (V.8).

965. *See* work papers for this report.

- S'^C represents the change in the product price resulting from a small change in the take rate in the competitive setting. I solve for S'^C in terms of the take rate and pass-through rate: $S'^C = \frac{\gamma}{(1-t^C\gamma)} S^C$. Appendix 3 contains a derivation of this expression.

- ε_{OS}^C is the seller-side product price elasticity of demand for transactions in the Android App Distribution Market and In-App Aftermarket. Given the other inputs to the monopoly model, the value of ε_{OS}^C is implied by Equation (A.23).

- $\varepsilon_{OB,t}^C$ and $\varepsilon_{OS,t}^C$ are the "own-brand" take-rate elasticities of demand for transactions in the Android App Distribution Market and In-App Aftermarket for consumers and developers, respectively, in the presence of competition.

- P_B^C is equal to the (negative) price charged by Google to consumers for transactions made in the Android App Distribution Market and In-App Aftermarket in the competitive scenario. I hold the buyer-side platform price fixed in proportion to the product price: $P_B^C = \left(\frac{P_B^M}{S^M}\right) S^C$.

444. Table A4 shows the results of the single market take rate model. At a pass-through rate of $\gamma = 91.1$ percent, the resulting but-for average price is [redacted], down from the observed price of [redacted] (net of Google's promotional expenditures to consumers). This difference results in aggregate damages of [redacted] for the U.S. for the period 8/12/2016 – 5/31/2022. Following the same steps taken in Section VI.B.3, I estimate that Google's take rate elasticities shift from [redacted] (in the monopoly setting, as calculated using Equation (V.3)) to [redacted] in the competitive setting. Because this model is applied to both paid initial downloads and In-App purchases, the elasticity values vary slightly from those shown in Table 6 (which reflect paid initial downloads only)

TABLE A4: SINGLE TAKE RATE MODEL, IMPACT AND DAMAGES,
(U.S., 8/16/2016 – 5/31/2022)

Actual World (Monopoly, Eqn. (3))

#	Input	Description	Value	Source/Notes
[1]		Consumer Expenditure (US; Before Discounts)	[redacted]	GOOG-PLAY 005535886; Google Transaction Data (US Consumers)
[2]		Google Revenue (US; Before Discounts)		*Id.*
[3]		Google Promotional Expenditures (US)		*Id.*
[4]		Android App Distribution (Paid) and In-App Aftermarket Transactions (US)		*Id.*
[5]=[1]/[4]	S^M	App Product Price		Calculated
[6]=[2]/[1]	t^M	Take Rate		Calculated
[7]=-[3]/[4]	P_B	Buyer-side Platform Price		Calculated
[8]=[5]+[7]	$S^M + P_B$	App Product Price Net of Discounts		Calculated
[9]	C	Marginal Cost		GOOG-PLAY-000416245; GOOG-PLAY-010801682
[10]	γ	Pass-through Rate		Estimated (See Table 13)
[11]	$\varepsilon^M_{B,t} + \varepsilon^M_{S,t}$	Take Rate Elasticities of Demand		Calculated (Eqn. (V.3))

But-For World (Competitive, Eqn. (4))

	Input			Source
[12]	S^C	App Product Price	[redacted]	Calculated (Eqn. (V.8))
[13]	t^C	Take Rate		Calculated (Eqn. (V.5))
[14]=([7]/[5])*[12]	P_B	Buyer-side Platform Price		Calculated
[15]=[12]+[14]	$S^C + P_B$	App Product Price Net of Discounts		Calculated
[16]=[9]	C	Marginal Cost		GOOG-PLAY-000416245; GOOG-PLAY-010801682
[17]=[10]	γ	Pass-through Rate		Estimated (See Table 13)
[18]	$\varepsilon^C_{OB,t} + \varepsilon^C_{OS,t}$	Take Rate Elasticities of Demand		Economic theory/empirical studies
[19]=[8]-[15]		Consumer Savings Per Transaction		Calculated
[20]=[19]*[4]		**Aggregate Damages**		Calculated

Notes: See notes for Table 6, *supra*.

445. Table A5 shows the results of the hybrid version of the Single Take Rate model, which solves simultaneously for equilibrium prices on both sides of the market. The consumer subsidy would increase to [redacted] per transaction, up from [redacted] per transaction in the actual world. The but-for take rate is [redacted], down from [redacted] in the actual world. The combined effect of a higher buyer-side subsidy and a lower take rate yields aggregate damages to the Class of [redacted].

TABLE A5: SINGLE MARKET HYBRID MODEL, (U.S., 8/16/2016 – 5/31/2022) [966]

Actual World (Monopoly, Eqns. (V.3, V.11))				
#	**Input**	**Description**	**Value**	**Source/Notes**
[1]		Consumer Expenditure (US; Before Discounts)	[redacted]	GOOG-PLAY 005535886; Google Transaction Data (US Consumers)
[2]		Google Revenue (US; Before Discounts)		*Id.*
[3]		Google Promotional Expenditures (US)		*Id.*
[4]		Android App Distribution (Paid) and In-App Aftermarket Transactions (US)		*Id.*
[5]=[1]/[4]	S^M	App Product Price		Calculated
[6]=[2]/[1]	t^M	Take Rate		Calculated
[7]=-[3]/[4]	P_B	Buyer-side Platform Price		Calculated
[8]=[5]+[7]	$S^M + P_B$	App Product Price Net of Discounts		Calculated
[9]	C	Marginal Cost		GOOG-PLAY-000416245; GOOG-PLAY-010801682
[10]	γ	Pass-through Rate		Estimated (See Table 13)
[11]	$\varepsilon^M{}_B$	Consumer-side Product Price Elasticity of Demand		Calculated (Eqn. (V.11))
[12]	$\varepsilon^M{}_{B,t}$	Consumer-side Take Rate Elasticity of Demand		Calculated (Eqn. (A.18))
[13]	$\varepsilon^M{}_S$	Developer-side Price Elasticity of Demand		Calculated (Eqn. (A.22))
[14]	$\varepsilon^M{}_{S,t}$	Developer-side Take Rate Elasticity of Demand		Calculated (Eqn. (V.3))
[15]	$\varepsilon^M{}_{B,t} + \varepsilon^M{}_{S,t}$	Take Rate Elasticities of Demand		Calculated (Eqn. (V.3))
But-For World (Competitive, Eqns. (V.5), (V.12))				
	Input			**Source**
[16]	S^C	App Product Price	[redacted]	Calculated (Eqn. (V.8))
[17]	t^C	Take Rate		Calculated (Eqn. (V.5))
[18]=([7]/[5])*[16]	P_B	Buyer-side Platform Price		Calculated
[19]=[16]+[18]	$S^C + P_B$	App Product Price Net of Discounts		Calculated
[20]=[9]	C	Marginal Cost		GOOG-PLAY-000416245; GOOG-PLAY-010801682
[21]=[10]	γ	Pass-through Rate		Estimated (See Table 13)
[22]	$\varepsilon^C{}_{OB}$	Consumer-side Product Price Elasticity of Demand		Economic theory/empirical studies
[23]	$\varepsilon^C{}_{OB,t}$	Consumer-side Take Rate Elasticity of Demand		Calculated (Eqns. (A.19), (A.8))
[24]	$\varepsilon^C{}_{OS}$	Developer-side Price Elasticity of Demand		Economic theory/empirical studies
[25]	$\varepsilon^C{}_{OS,t}$	Developer-side Take Rate Elasticity of Demand		Calculated (Eqn. A.23)

966. For sources and notes, *see* notes to Table 6, *supra*.

[26]=[23]+[25]	$\varepsilon^{C}_{OB,t} + \varepsilon^{C}_{OS,t}$	Take Rate Elasticities of Demand	[redacted]	Calculated
[27]=[8]-[19]		Consumer Savings Per Transaction		Calculated
[28]=[27]*[4]		**Aggregate Damages**		Calculated

APPENDIX 5: DAMAGES BY STATE

TABLE A6: BY STATE IN-APP AFTERMARKET DAMAGES (8/16/2016 – 5/31/2022)

State	% of Consumer Expenditure	Combined App/In-App Model Damages	Discount Model Damages	Single Take Rate Model Damages	Hybrid Model Damages	Amazon Discount Model Damages
AL	[redacted]					
AK						
AS						
AZ						
AR						
CA						
CO						
CT						
DE						
DC						
FM						
FL						
GA						
GU						
HI						
ID						
IL						
IN						
IA						
KS						
KY						
LA						
ME						
MH						
MD						
MA						
MI						
MN						
MS						
MO						
MT						
NE						
NV						
NH						
NJ						

State	% of Consumer Expenditure	Combined App/In-App Model Damages	Discount Model Damages	Single Take Rate Model Damages	Hybrid Model Damages	Amazon Discount Model Damages
NM						
NY						
NC						
ND						
MP						
OH						
OK						
OR						
PW						
PA						
PR						
RI						
SC						
SD						
TN						
TX						
UT						
VT						
VI						
VA						
WA						
WV						
WI						
WY						
AE						
AP						
AA						
N/A						
Total						

Sources: Google Transaction Data; Table 22.

APPENDIX 6: LOGIT DEMAND CURVE ESTIMATES (GAME SUBCATEGORIES)

App Category	(1) OLS Price Coefficient	(2) IV Price Coefficient
Action	[redacted]	
Adventure		
Arcade		
Board		
Card		
Casino		
Casual		
Educational		
Music		
Puzzle		
Racing		
Role Playing		
Simulation		
Sports		
Strategy		
Trivia		
Word		
Includes FE?		
Number of FE		
Observations		
R-Squared		

Notes: *p*-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Each column reports the logit price coefficient corresponding to a given Play store subcategory. Coefficient estimates calculated using a single, fully-interacted regression model allowing coefficients to vary across the 17 Play Store subcategories. I have excluded the "Family" game subcategory, which is comprised of [redacted]. Fixed effects

are unique to App name, App subproduct, purchase type (App sale, In-App purchase, subscription), customer state, App category, and year.

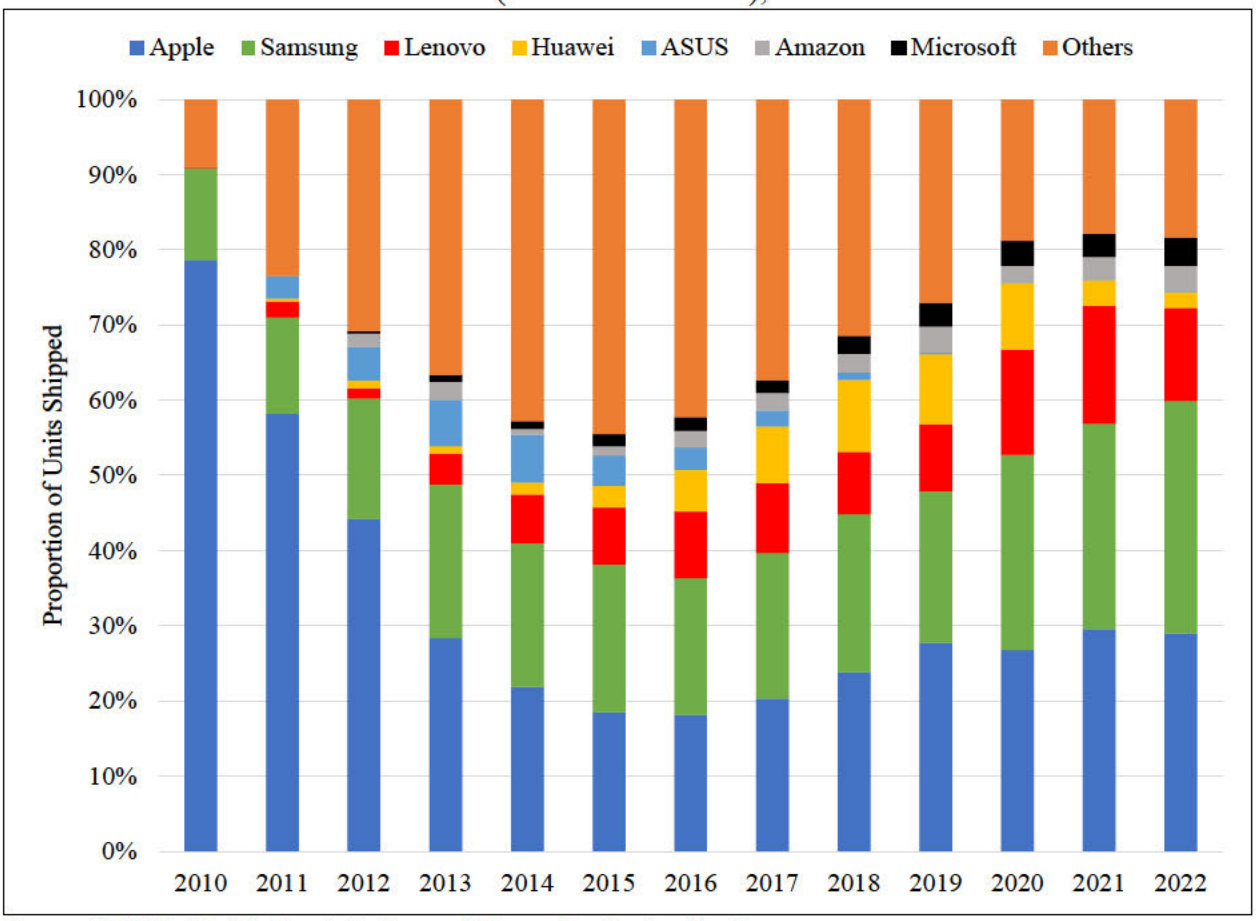
APPENDIX 7: PASS-THROUGH RATES (GAME SUBCATEGORIES)

App Category	Pass-Through Rate
ALL GAMES	**79.1%**
ACTION	81.4%
ADVENTURE	70.7%
ARCADE	87.2%
BOARD	80.5%
CARD	88.6%
CASINO	91.8%
CASUAL	57.4%
EDUCATIONAL	52.3%
MUSIC	68.6%
PUZZLE	89.5%
RACING	83.7%
ROLE PLAYING	95.5%
SIMULATION	93.7%
SPORTS	77.8%
STRATEGY	86.5%
TRIVIA	60.5%
WORD	81.4%

Notes: I have excluded the "Family" game subcategory, which is comprised of only 3 app titles with a total consumer spend of [redacted]

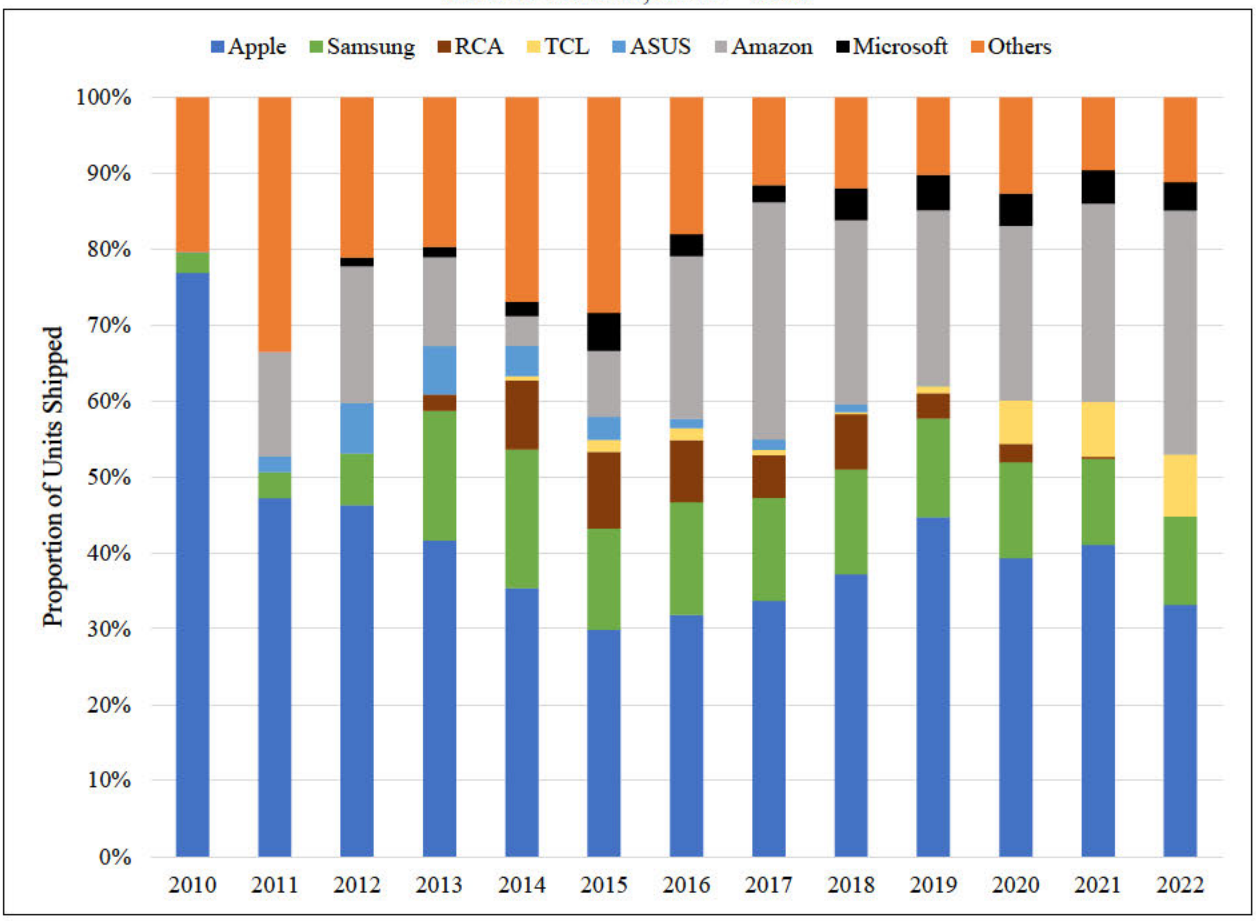
APPENDIX 8: MARKET SHARE STATISTICS FOR TABLETS

FIGURE A8-1: OEM SHARE OF TABLET UNIT SHIPMENTS WORLDWIDE (EXCLUDING CHINA), 2010 – 2022



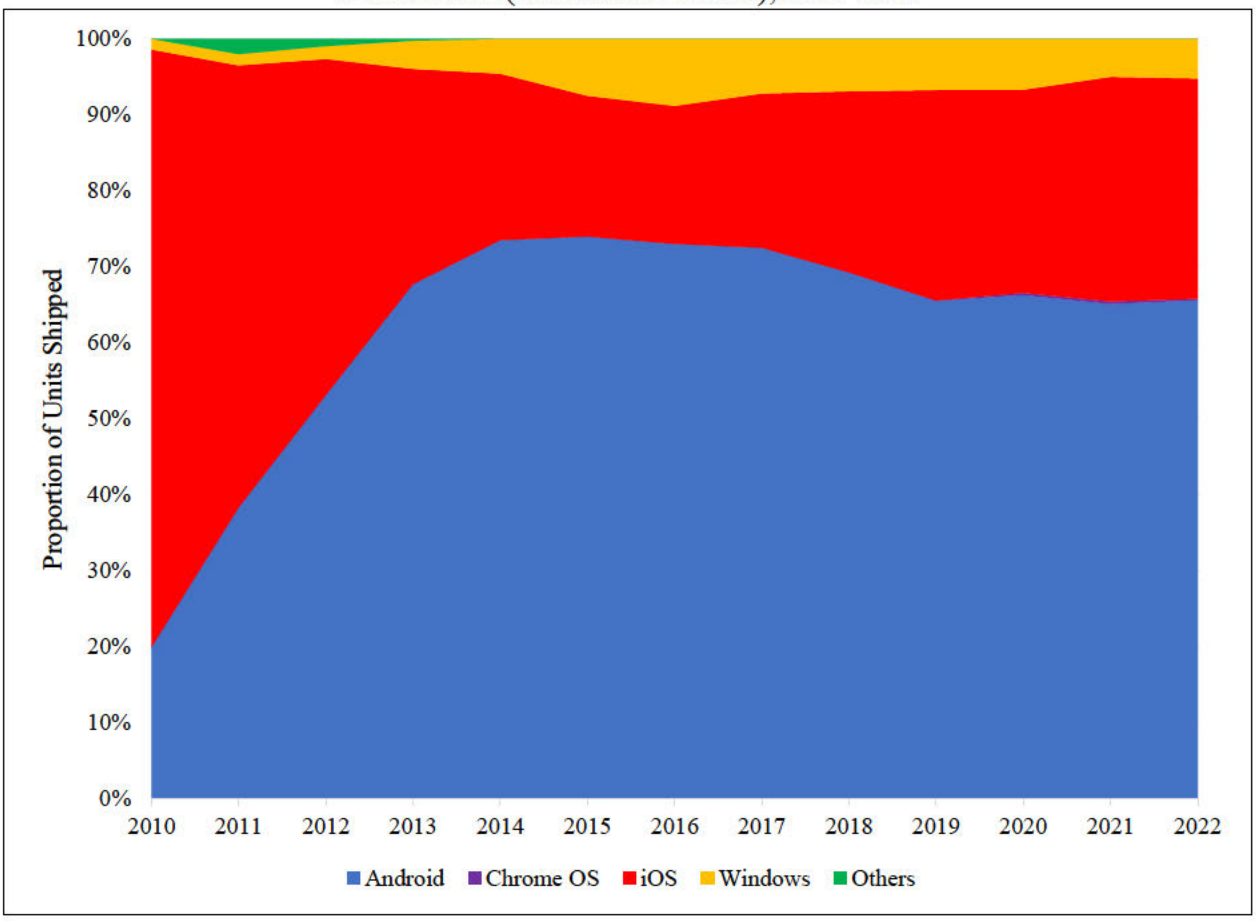
Source: IDC Worldwide Quarterly Personal Computing Device Tracker.

FIGURE A8-2: OEM SHARE OF TABLET UNIT SHIPMENTS
UNITED STATES, 2010 – 2022



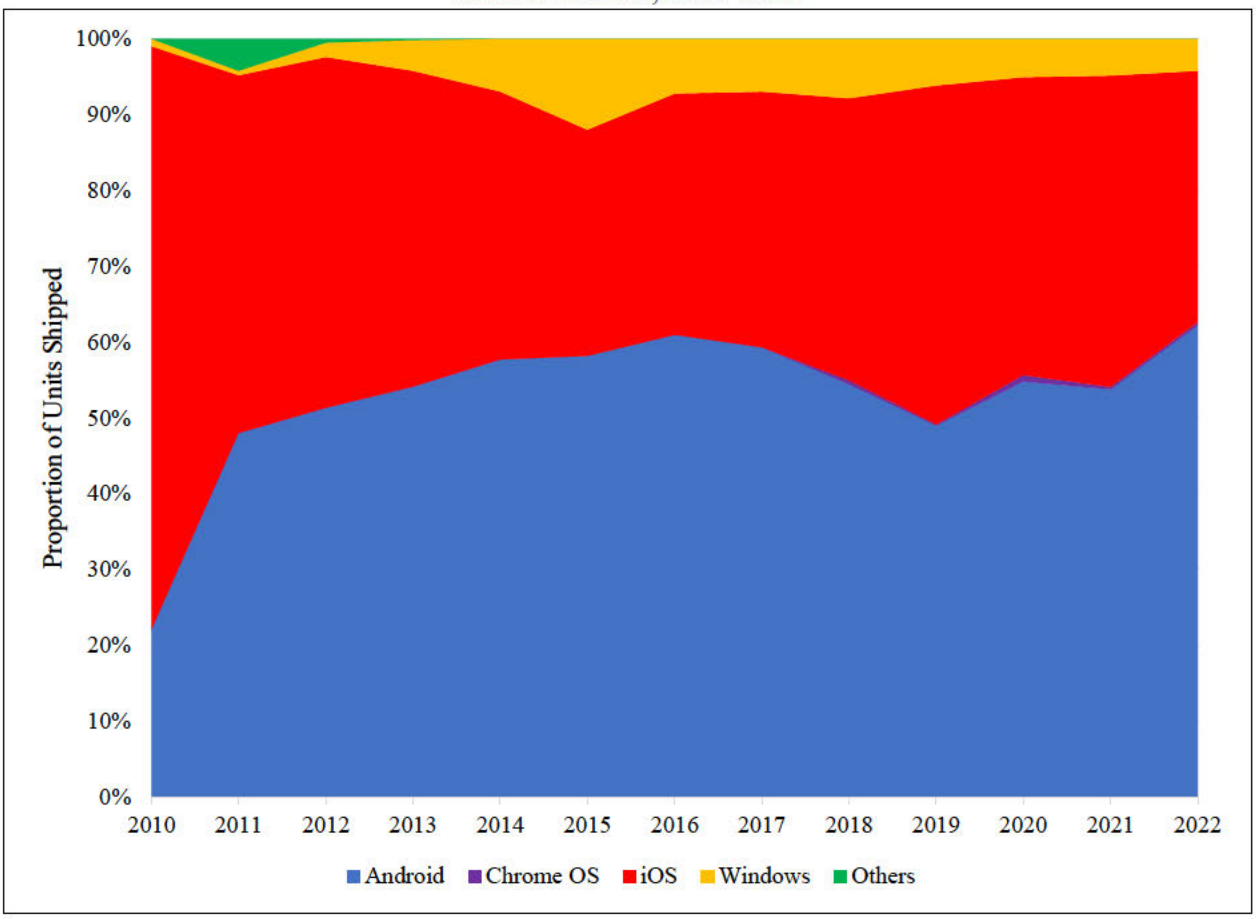
Source: IDC Worldwide Quarterly Personal Computing Device Tracker.

FIGURE A8-3: TABLET OS SHARE OF TABLET UNIT SHIPMENTS WORLDWIDE (EXCLUDING CHINA), 2010-2022



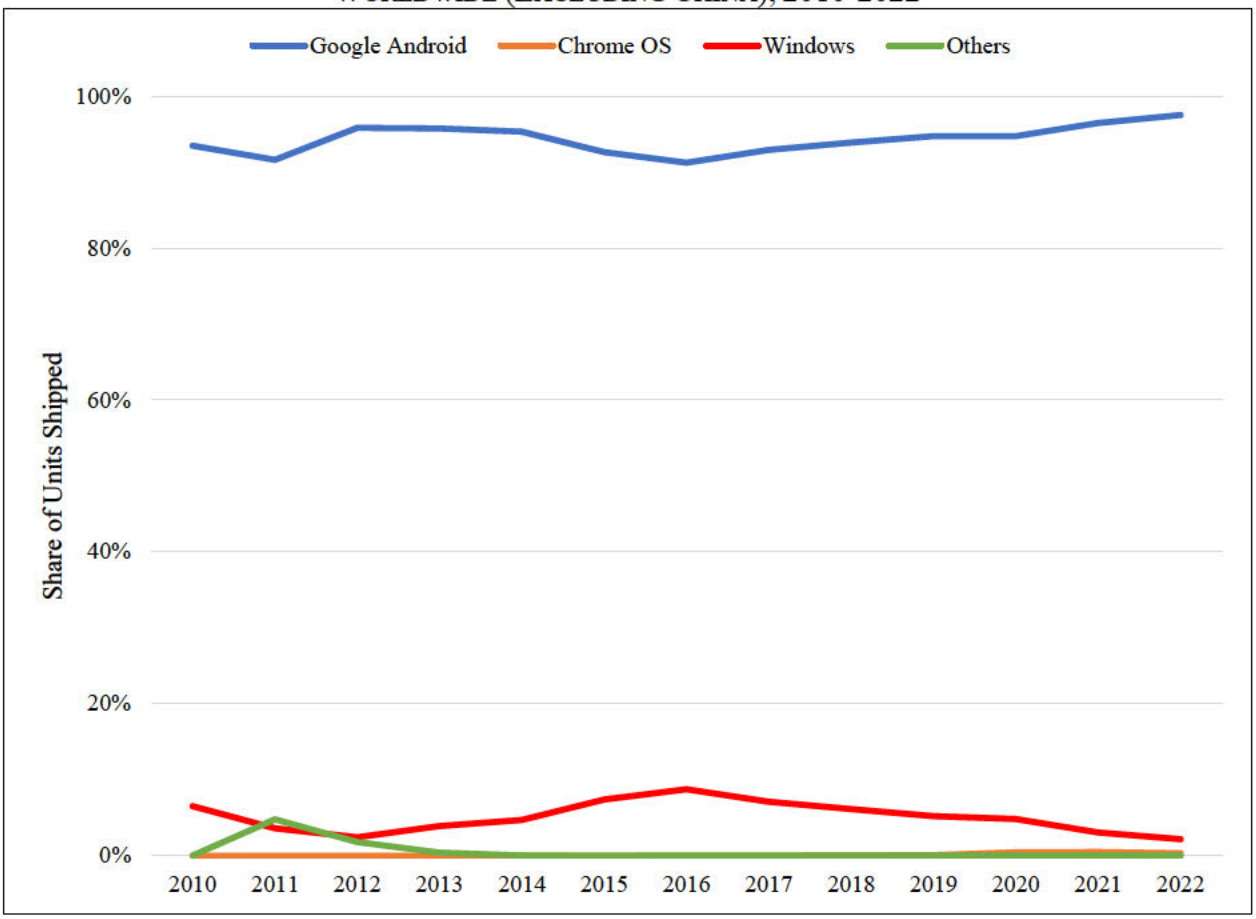
Source: IDC Worldwide Quarterly Personal Computing Device Tracker. Windows includes Windows RT.

FIGURE A8-4: TABLET OS SHARE OF TABLET UNIT SHIPMENTS
UNITED STATES, 2010-2022



Source: IDC Worldwide Quarterly Personal Computing Device Tracker. Windows includes Windows RT.

FIGURE A8-5: LICENSED TABLET OS SHARE OF TABLET UNITS SHIPPED WORLDWIDE (EXCLUDING CHINA), 2010-2022



Source: IDC Worldwide Quarterly Personal Computing Device Tracker. Windows includes Windows RT.

APPENDIX 9: AVAILABILITY OF TOP 100 PLAY STORE APPS IN APPLE APP STORE

Rank	App Name	In Apple App Store?
1	[redacted]	Yes
2		Yes
3		Yes
4		Yes
5		Yes
6		Yes
7		Yes
8		Yes
9		Yes
10		Yes
11		Yes
12		Yes
13		Yes
14		Yes
15		Yes
16		Yes
17		Yes
18		Yes
19		Yes
20		Yes
21		Yes
22		Yes
23		Yes
24		Yes
25		Yes
26		Yes
27		Yes
28		Yes
29		Yes
30		Yes
31		Yes
32		Yes
33		Yes
34		Yes
35		Yes
36		Yes
37		Yes
38		Yes
39		Yes
40		Yes
41		Yes

Rank	App Name	In Apple App Store?
42	[redacted]	Yes
43		Yes
44		Yes
45		Yes
46		Yes
47		Yes
48		Yes
49		Yes
50		Yes
51		Yes
52		No
53		Yes
54		Yes
55		Yes
56		Yes
57		Yes
58		Yes
59		Yes
60		Yes
61		Yes
62		Yes
63		Yes
64		Yes
65		Yes
66		Yes
67		Yes
68		Yes
69		Yes
70		Yes
71		Yes
72		Yes
73		Yes
74		Yes
75		Yes
76		Yes
77		Yes
78		Yes
79		Yes
80		Yes
81		Yes
82		Yes
83		Yes

Rank	App Name	In Apple App Store?
84	[redacted]	Yes
85		Yes
86		Yes
87		Yes
88		Yes
89		Yes
90		Yes
91		Yes
92		Yes
93		Yes
94		Yes
95		Yes
96		Yes
97		Yes
98		Yes
99		Yes
100		Yes

Sources: Google Transactional Data; Apple App Store, https://www.apple.com/app-store/